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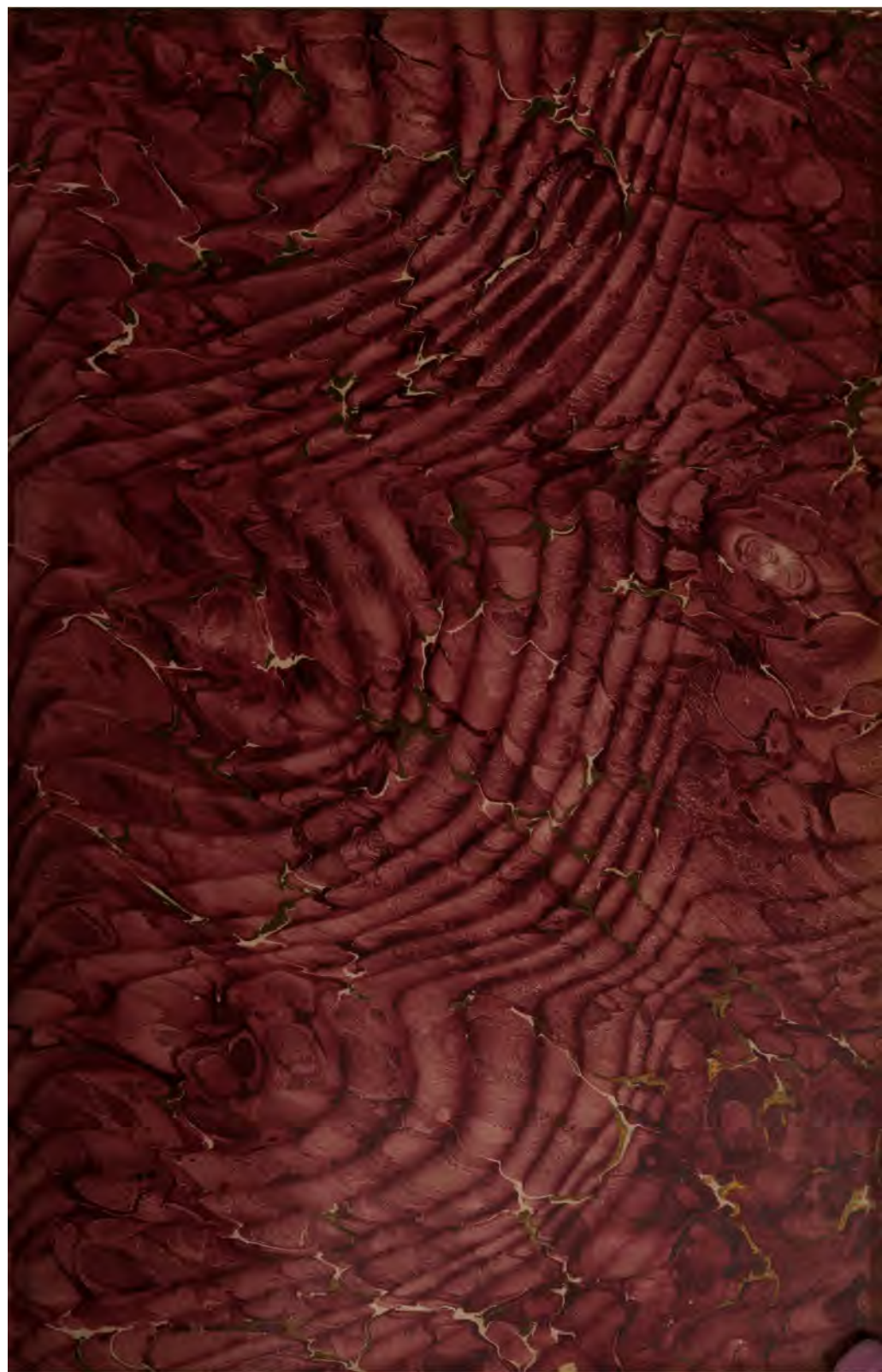
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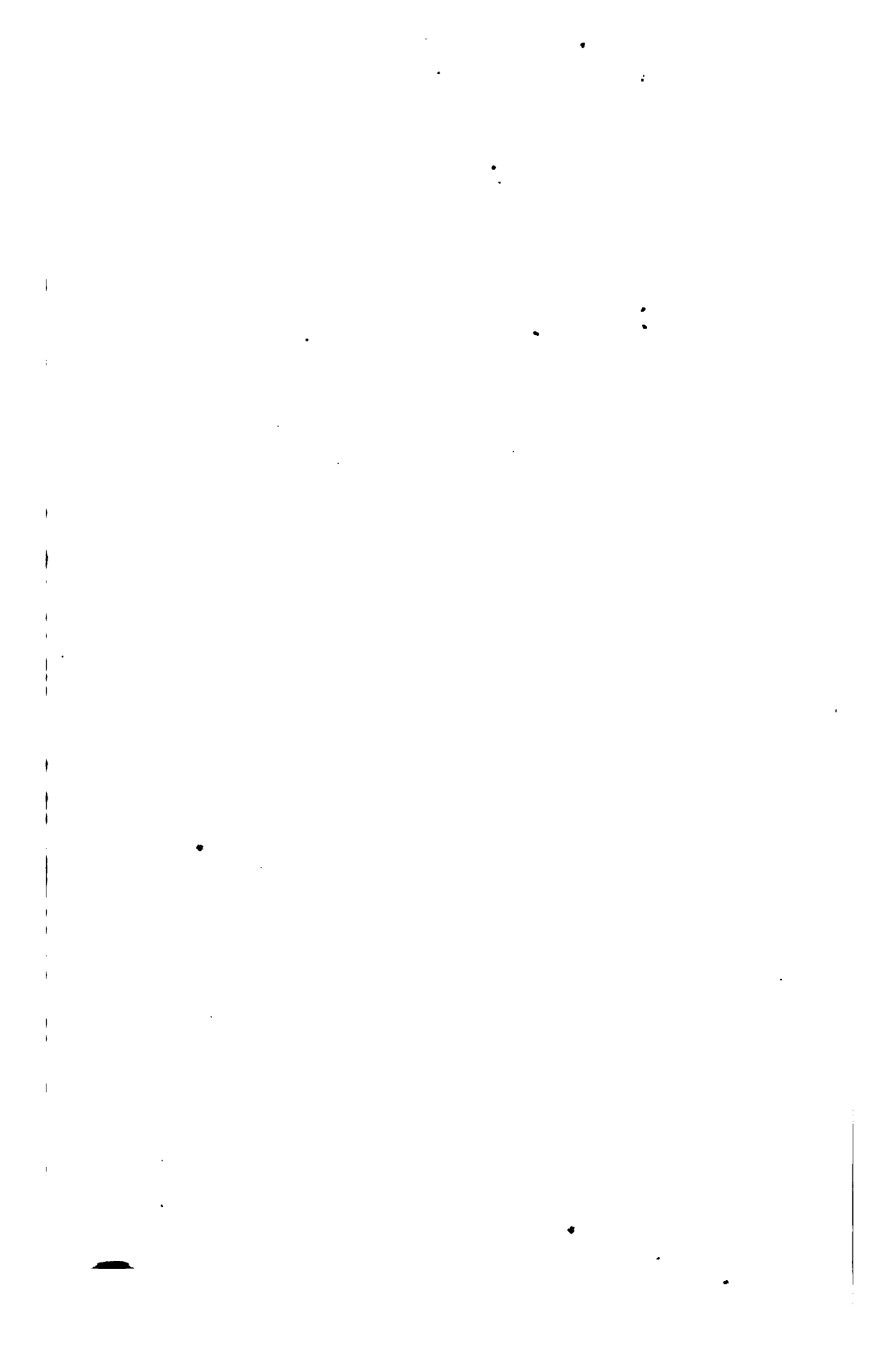


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THE
RAY SOCIETY.

Publication. v. 69,

INSTITUTED MDCCCXLIV.



*This volume is issued to the Subscribers to the RAY SOCIETY for
the Year 1891.*

LONDON:

MDCCCXCIII.

THE LARVÆ
OF THE
BRITISH BUTTERFLIES
AND
MOTHS.

BY
(THE LATE)
WILLIAM BUCKLER,
=



EDITED (IN PART) BY (THE LATE)
H. T. STANTON, F.R.S.

VOL. V.
(THE SECOND PORTION OF THE NOCTUÆ.)

LONDON:
PRINTED FOR THE RAY SOCIETY.

MDCCKXCIII.

W

PRINTED BY ADLARD AND SON,
BARTHOLOMEW CLOSE, E.C., AND 20, HANOVER SQUARE, W.

Dunning
Sharp
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PREFACE.

THE delay in the appearance of this volume has been almost entirely occasioned by difficulties experienced in connection with hand-colouring the plates.

At the commencement of Mr. Stainton's long and, as it unhappily proved, fatal illness, the plates were already all lithographed, and he was able to begin the copying out of the manuscript for the letterpress, but could not proceed far with it. The task was completed by Mr. W. D. Roebuck of Leeds, under the supervision of Mr. G. T. Porritt of Huddersfield, so well known for his experience regarding the Larvæ of British Macro-Lepidoptera. Mr. Porritt has kindly undertaken to edit the remaining volumes in succession to Mr. Stainton, and he has already in hand Vol. VI, which will complete the *Noctuæ*.

For many reasons it is desirable that the colouring of the plates should be continued by the same artist, but if any serious delay again occur, arrangements for expediting the work will have serious attention.

In the present volume it will be seen that the number of British species, of which no figure whatever was made by the late Mr. Buckler, is comparatively small. But the descriptive text is necessarily incomplete, for no descriptions of many of the species were published by him, nor do they occur in his Note Books, nor, with few exceptions, amongst the published descriptions by the late Mr. Hellins. A few of the missing descriptions have been supplied from those published by Mr. Porritt.

R. McLACHLAN, *Treasurer*.
THOS. WILTSHIRE, *Secretary*.

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THE LARVÆ

OF THE

BRITISH MOTHS.

AGROTIS PUTA.

Plate LXX, fig. 3.

THANKS to the kindness of the Rev. J. Hellins and Dr. Hearder, the larva of *Agrotis puta*, that has so long remained unknown, is now figured and described.

Eggs were sent by Dr. Hearder to Mr. Hellins, August 29th, 1867, from which larvæ were hatched, September 2nd, and, as they showed at first a preference for lettuce, they were reared on that plant, varied occasionally with slices of the root of garden carrot.

Mr. Hellins tried some of them in a flower-pot with growing plants of dandelions and knot-grass, both of which plants were eaten, but apparently not so freely as the lettuce; but the worst part of the business was that the soil in the pot was infested with little earth-leeches, which destroyed most of the larvæ. The rest were treated in the same manner as we had been accustomed to deal with *A. ripæ*; i.e., placed in a large pot with a quantity of sea-sand, their food

being laid on the surface, and here they prospered satisfactorily.

On October 21st, some had grown about five-eighths of an inch long, and at that date figures were taken, and again on November 14th, when the most advanced had attained its maximum growth of one inch and one-eighth in length. On the 24th December I had more examples of similar dimensions.

The larva has a small head and anal segment, the body being plump and cylindrical, with a rather semi-circular inflation on the region of each spiracle; the segmental divisions deeply cut; the legs and pro-legs small in proportion.

The colour of the back is at first dark ochreous brown, but changes gradually with its growth to brownish ochreous or dull ochreous; this tint is bounded on either side by the dark brown edge of the sub-dorsal line; there is a delicate mottling of rather darker brown, of a pear shape, on each segment, its broad end in front, through which runs the dorsal line, which is of the brown colour (paler when the larva is quite full-grown), and is very thin at the beginning but expands almost into an elongated diamond form at the end of each segment, and is distinctly edged with darker brown, particularly at its widest part.

The sub-dorsal line is dark brown, having close beneath it a mere thread of very pale greenish-grey; and from this to the spiracles, the sides are greyish brown; another pale thread, much interrupted, running a little above the spiracles.

Below the spiracles is a very faint trace of a double dirty whitish line, all the rest of the lower and under surface being a pale greenish-grey tint and semi-translucent.

The head brown, the lobes and mouth marked with darker brown, and very shining. A dark brown plate on the second segment having three pale longitudinal lines.

The spiracles are black, and the tubercular warty dots very dark brown, each furnished with a very minute short hair.

On the 14th January, 1868, I observed one larva no more than half-grown, whilst the full-grown larvæ had lost much of their distinctive markings by becoming more unicolorous in tint, a proof of their being now full-fed. (W. B., E.M.M., IV, 199, February, 1868.)

AGROTIS LUNIGERA.

Plate LXXI, fig. 2.

Some years ago Mr. W. Farren obtained a few eggs from a pinned ♀ of this species, which were laid on the cork of his collecting-box, and he cut them out and kindly sent them to me; but as they hatched in transit, I failed in attempting to rear them.

It is now with the greatest satisfaction that I am enabled to describe this larva, thanks to the persevering exertions of Mr. Thomas Terry in rearing a few eggs, obtained in a similar way, from a ♀ that had previously been poisoned and pinned.

The young larvæ, when first hatched, and until after their third moult, were supplied with grasses, dock, dandelion, and other food; but they fed only on the dandelion, and preferred the withered leaves, perforating them with small round holes. When they came into my possession, I supplied them with *Polygonum aviculare*, which they attacked ravenously, and would never after eat dandelion. Their growth and condition became so satisfactory, that I have no doubt this is one of their natural food-plants.

They were sent to me on the 21st of last August, being then three lines long, and in six days were half an inch, and by the 8th of September one inch in length and thick in proportion: they evinced great aversion to light, and a desire for burrowing.

When half an inch long, they were pale ochreous or flesh colour on the back, the sides greyish-green, their bellies of the same tint, but paler, and on the back of each segment a V-like mark of brown, inverted, with the apex in front, through which passed the pale buff dorsal line, most conspicuous through the black plate on the second segment. On the two sides of the inverted V mark were placed the usual four tubercular warts, black and large in proportion, and very conspicuous.

When they had attained an inch in length, the inverted V marks had disappeared, and the larvæ had become much darker; the central part of the back on each segment mottled with dark brown, in the form of a diamond with the points cut off; the spaces next the sub-dorsal line buff colour, and wedge-shaped.

The dorsal line conspicuously sulphur-yellow on the black shining plate of the second segment only, while on all the other segments scarcely noticeable, and chiefly at the commencement of each, as rather paler brown than the mottled portions it runs through.

The anal segment buff colour, forming a conspicuous pale mark above the flap.

The sides blackish-green, bounded above by the sub-dorsal line of rather darker hue, and below by the black spiracles and usual warty tubercles; the sub-dorsal line is edged below by a fine thread of dirty whitish-green, and another such fine line, but undulating and interrupted, runs between it and the spiracles. Above the legs is a pale, thin, dirty whitish line; the belly and legs slightly darker, of a greenish-drab tint; the ventral pro-legs more beneath the body than usual; all the tubercular warts blackish, large, and shining. The head mottled-brownish, with a large black blotch on each side of the crown.

When the larvæ were an inch and a quarter long, and even a trifle longer, their details of markings and colours were just the same, but more intense and

bright; the larvæ were then in their best coats, and very thick and plump. Soon after, about the middle of September, on attaining their maximum length—an inch and a half when stretched out—their colours and markings began gradually to fade away into a monotonous dirty brown on the back, with greyish sides, and their condition was less plump; the tubercular warts changed to brown rings, enclosing buff dots, the hair or bristles from each only visible through a powerful lens; and by the end of October they began to diminish in length, with other manifestations of turning to pupa. (W. B., E.M.M., III, 188, January, 1867.)

On the 6th August, 1875, I received from Mr. J. G. Ross, of Bathampton, twelve eggs, part of a batch laid by a ♀ *A. lunigera* captured on July 26th, and which began laying August 2nd.

The eggs on arrival were of a dirty white, and in the course of a few days began to show a faint pinkish zone round the middle, and a spot of pinkish on the top.

The egg is small, circular, rounded at top, and a little flattened beneath; on the 12th August two of the eggs began to turn grey, becoming lead colour on the 13th, when they began to hatch.

The newly-hatched larva is greenish-grey, with a dark brown head. On the 19th they had become of a pale brownish-ochreous colour, with the head brown, and a small brown plate on the second segment, and minute dark brown tubercular dots; they fed on knot-grass.

On the 28th the tubercular dots appeared more plainly on a still rather ochreous ground-colour, and a distinct whitish dorsal line was visible. On September 6th they had grown to rather more than a quarter of an inch in length, and were much darker in colour; they were now ochreous-brown on the back, with an ochreous dorsal line and a wedge-shaped mark at the hinder part of each segment on either side, the point of the wedge touching the hinder tubercular dot

of the trapezoidals, and from these a darkish brown imperfect chevron passes with its apex in front at the beginning of each segment, but intersected by the uninterrupted paler dorsal line finely edged with dark brown, the ground being freckled with darker; the sides of the larva brownish-grey, with the usual somewhat interrupted pale lines very faint, the sub-spiracular stripe pale greyish, all the tubercular warts black and shining, and large in proportion; a large black-brown blotch on each lobe of the shining head, and a shining black-brown plate, divided by a pale dorsal line, on the second segment.

As only two of the eggs had hatched with me, and Mr. Ross had no better luck, he kindly sent me two larvæ at this date, and now the four larvæ began to grow well, and in addition to knot-grass, which soon began to lose its succulence, I added leaves of *Plantago major*, which they seemed to like equally well, and by the middle of October it became their only food. Towards the end of the month they were looking their best, with their glossy skins of dark greyish-greenish at their sides, more brownish on the back, the chevrons long since vanished, but the rather pale ochreous wedges and the patch of this colour on the anal segment still remained and the dark blackish-brown tubercular warty dots were still conspicuous; *the hinder pairs of the trapezoidals larger than the front pairs and the one behind each spiracle larger than the one above*: the spiracles small and black; the head had a large blackish blotch on the crown of each lobe, which split into two streaks down the front and side, and a separate shorter streak was on the back of the cheek, and a spot or dash in the triangular space above the mouth.

The pale lines above described were very ragged and interrupted in character, not showing within any of the deep wrinkles; below the spiracles the colouring was of a very pale dirty whitish-drab, or greenish tint, having a double ragged interrupted line beneath

the spiracles, and here the tubercular dots were paler than those on the back. The larvæ were then from one inch three-eighths to one inch and a half in length, thick and stout in proportion.

At the beginning of November I gave them some fine loose soil to burrow in, continuing to supply plantain and a little chickweed, of which latter they ate but sparingly, evidently preferring the plantain.

From this time the larvæ came up out of the soil but seldom until January, when they ate and tunnelled through some pieces of carrot, with which they were supplied all through February. (W. B., 1875, Note Book III, 21, 22, 52, 53.)

AGROTIS EXCLAMATIONIS.

Plate LXXI, fig. 3.

A female moth taken at sugar, June 13th, 1874, by the Rev. A. Fuller, began to lay eggs on a piece of lino on the 14th, and continued till the 22nd, when she died after depositing 171 eggs.

The egg is of considerable size for an *Agrotis*, being larger than that of *A. saucia*; it is rounded above and flattened beneath, thickly ribbed, and with fine reticulations. When first laid it is whitish and semi-opaque but changes in a few hours to a more glistening dirty flesh-colour; by the fifth day the opacity had gradually become greater than at first, and a dull purplish-pink blotch appeared at the top, and a narrow zone at a short interval below; this narrow zone is in most instances a little blotched irregularly.

These eggs changed colour to an opaque pinkish-grey on the 26th of June and began to hatch early the following morning, all the larvæ being out of their shells by the evening of the 29th.

The newly-hatched larvæ were pale greyish, with blackish-brown heads and plate on second segment,

and brownish tubercular dots and hairs; they were supplied with grass and plantain, the latter being preferred. By the 8th of July most of the larvæ were two and a half lines in length, with brown heads and bodies of a light dirty greenish-brown, deepest in tint on the back, with a distinct paler dorsal line and dark brown tubercular dots having quite a miniature appearance of the adult larva. For a week they had only had *Plantago major*, but now I offered them some *Chenopodium album*, which they seemed greatly to prefer. By the 20th July they had become half an inch long, and of their characteristic warm brown colour.

I now again changed their food and gave them plantain and pieces of carrot, which seemed to suit them better than the *Chenopodium*, and by August 24th, they were seven-eighths of an inch in length, and perhaps at the best time for observing their characteristic markings; the ground colour being a rather warm brown, varying in intensity a little in individuals, some being rather paler than others, but the brood otherwise being very constant in colour and design.

Down the middle of the back on each segment is a pear-shaped blotch of darker brown, composed of freckles, the broad end of the pear in front; through these the dorsal line can scarcely be traced beyond the thoracic segments, although it begins on the second segment by dividing the shining dark plate there, as a distinctly paler line, outlined with dark-brown, but on the third and fourth segments it soon becomes suffused with the ground colour, and its course thence is but faintly indicated by the dark outlines, which can best be discerned at the end of a segment; the sub-dorsal line is of darkish brown above and rather festooned in its course, thinly edged beneath with a faint paler line, which is followed by a broader line of darkish freckles, and then by a paler line of the ground colour, and this in turn by a stripe of darker freckles,

on the lower edge of which the spiracles are situated; beneath these after a line of ground colour is a paler or dirty whitish line followed by the drab-coloured ground of the belly.

Note that the ground colour of the back, as far as the spiracles, is a warm brown, of a lighter or darker tint; the ground colour of the lower surface below the spiracles is drab, paler than the back.

The head is of a brownish-drab, darkest about the mouth, with a blackish-brown streak down the front of each lobe; on the second segment the shining plate is margined in front with dark brown, through which runs the pale line before mentioned.

The tubercular or warty dots or trapezoidals of the back are dark-brown, the hinder pairs a little larger than the front pairs; those on the sides are rather paler brown, and those below the spiracles still paler, and each bearing a short bristly hair. The spiracles are quite black and furnish the important character by which at a glance this larva can be distinguished from its congener *A. segetum*, as in *A. exclamationis*, the spiracles are never smaller but generally larger than the wart-like dots immediately above and behind them.

The warm brown of the back (without regard to depth of tint) without a tinge of grey or green may help us to determine this larva, but an infallible guide is found in the extra large spiracles which distinguish *A. exclamationis*.

By the 2nd of September all but one individual had died off. (W. B., 1874, Note Book II, 76-78.)

AGROTIS CORTICEA.

Plate LXXI, fig. 4.

Few things have afforded me greater satisfaction than my having been able to figure and describe, I

believe for the first time, the larva of this species—one of those subterranean, dull-coloured larvæ, several species of which may so easily be mistaken one for another.

To Mr. George Norman, of Forres, my best thanks are due for the supply of eggs, which reached me July 17th, 1870. The larvæ were hatched between the 20th and 25th of the same month; those which I kept under my own care had grown to the length of half an inch by August 15th, and by October 5th to one inch and three-eighths, and, soon after November commenced, left off feeding, being, as I thought, ready for pupation; however, for some reason unknown to me, they all died without changing.

Meanwhile, the larvæ of which Mr. Hellins took charge grew more slowly, not being more than three-quarters of an inch in length when their hybernation commenced, and, luckily, several of them survived the winter; these began to feed again in March, moulted about the beginning of April, and were full-fed from about the end of April to the middle of May. The moths appeared between the 17th of June and 6th of July.

The egg is somewhat the shape of an orange, but with its under-side more flattened, with irregular, shallow ribs and reticulations over its surface, and a central boss or knob in a little depression on the top. It is straw-coloured at first, afterwards of a flesh colour, with pale brown zone or blotches.

When first hatched, the larva is of a greenish-grey, with blackish-brown head and plate behind it, the usual dots black, and furnished with hairs. After feeding for a few days, it becomes of a greenish-ochreous tint, and in another week of a greenish-olive, one example alone at this stage having been of a reddish-grey; the dots raised, and still furnished with noticeable hairs.

Up to this time, and for a few days longer, we found the habit of this larva was to feed uncovered on any

of the various fleshy-leaved plants offered to it, at first eating only the cuticle, but soon making holes in the leaves of *Chenopodium album*, *Polygonum*, clover, etc., but when the length of half an inch, or thereabouts, had been attained, and the usual *Agrotis* appearance put on, it began to burrow in the loose soil, hiding by day, and coming out to feed at night. Later in the year, and again in the spring, the food supplied was dock, mullein, hollyhock, and slices of carrot; and in dull weather, if fresh food was put on the surface of the soil, and shaded from the light by leaves thrown over it, we found it would be eaten as readily by day as by night. From the time the larva is about half an inch in length, up to about an inch, its colour is ochreous, with a dark double dorsal line, and two lines on each side; the usual warts small and dark brown.

After its final moult, it comes out at first very much darker than before, with quite a noticeable appearance of sootiness over it; all the lines being purplish-black, and much diffused; the skin also presents quite a rough surface, and although this is afterwards partly lost, it yet remains as a distinguishing feature to the end.

When full-grown, the larva is one and three-eighths to one and five-eighths inches in length, according to measurement in repose or motion; rather thick in proportion, cylindrical, and rugose; all the legs short and placed well under the body; in fact, it much resembles *A. segetum*, save in the rugosity, and in the further distinction, that whereas the back in *A. segetum* is coloured differently from the sides, in *A. corticea* the colour is spread uniformly over both alike; the ground colour then of the full-grown larva is brownish-grey, finely freckled with a rather darker tint of the same; the belly and pro-legs with a slight greenish tinge, and unfreckled; the dorsal vessel is of the ground colour, scarcely paler, enclosed within two lines of darker brown. The subdorsal is a dark line of grey-brown,

with a fine thread of paler along its lower edge, followed at a little distance by another such pale and rather thicker line, though much interrupted or broken by the deep wrinkles of the skin; at some distance below this runs the subspiracular stripe of the same paler greyish-brown, with a streak of the ground colour through the middle of it. The head has the front margins of the lobes broadly streaked with blackish, and a little at the sides also, and the mouth is large and sometimes blackish; the plate on the second segment is not so noticeable as usual in this genus by any difference in colour, though it is a little darker brown towards the margin in front; the dorsal and subdorsal paler threads are faintly seen to pass through it.

As the larva approaches full-growth the skin becomes somewhat shining, and the warts which immediately after the last moult came out black, grow paler in the centre, and are of a dark brown all round it, each still furnished with a short, fine bristle; the black spiracles are rather small in size.

As noticed before, the general appearance is more unicolorous than that of any species of *Agrotis* I have yet seen.

The pupa is of the ordinary *Agrotis* form, rather stout, and very smooth; at first whitish, and changing by degrees to a light orange-brown. (W. B., July, 1871; E.M.M., VIII, 89, September, 1871.)

AGROTIS CINEREA.

Plate LXXI, fig. 5.

On the 6th of June, 1882, I received from Mr. W. H. Ballett Fletcher, then at Oaklands, Hailsham, Sussex, sixteen eggs of this species, part of a batch laid by a captured moth.

The egg is globular or hemispherical, and ribbed

with about thirty ribs, some shorter than others, which reach to a circular raised ring at the top ; the base of the egg flat ; it is most minutely reticulated ; as it matures, the colour changes to a very pale pinkish-grey, and later a zone or ring of a deeper tint appears round the base.

As none of my eggs had hatched by June 22nd, I will here record Mr. Fletcher's report of his larvæ : to the first ten that hatched he only gave *Festuca ovina* as food, and they all starved on it ; since then he gave others a further choice of *Thymus serpyllum*, and they have thriven, and are up on the thyme every morning. He writes : " They are doing well on wild thyme. When first hatched they are yellowish, with very conspicuous black warts, each having a pin-shaped bristle ; in their second coat (after first moult) they show faintly the usual lines."

On the 29th June, Mr. Fletcher most generously sent me one of the three larvæ he had reared so far on wild thyme ; this had just *moulted a second time*, and measured over 4 mm. It was of the true *Agrotis* form, stout for its length, and of green colour, like the leaves of its food plant, showing a double dorsal line enclosing the finest thread of paler, a pale thin subdorsal line, edged above with a darker line ; after a short interval a pale stripe follows, and at a greater interval below is the broader pale spiracular stripe ; the belly and legs less pale ; the tubercular fine dark warty dots all in their usual situations ; the second segment of a paler ground colour like the head, and both more shining than the rest of the body ; by degrees the green ground colour changed to purplish-brown, which was quite noticeable on the 2nd of July.

By the morning of the 4th it had *moulted a third time*, and had now a bigger head, which previously was small ; the colouring of the body was at first, for a time, pale brown, but soon grew darker pinkish-brown ; all details as before. It can be seen that the wart behind

each spiracle is larger than other warts. The larva was now 9 mm. long when walking; it fed readily on *Thymus*. By the next day it had regained its depth of colour, a dingy pinkish-brown, with the details much less noticeable. On the 16th it *moulted a fourth time*, and became a dingy grey-brown; it *moulted a fifth time* on the 28th, and was then a very dark slaty-grey, though with greenish tinge on the belly. I figured it on the 7th, 8th and 9th August, when it was an inch and a quarter long. On the 13th August it was laid up for another moult, and by the evening of the 15th it had *moulted a sixth time*; it was at first dark slaty bluish-green; the front margin only of the plate on the second segment was then black, the rest of the plate was green, and the fine pale dorsal and subdorsal threads ran through the black as well as the green; the next day it was more dingy than ever—quite a blackish-green; the spiracles rather large and black, spots dark brown, plate growing darker, the skin with loose folds (it had not yet fed since moulting). On the 18th it again began to feed, though sparingly, and by the 27th had much increased in thickness, and a little in length; the dark brown tubercular dots on the back were largest on the thoracic segments; at this date it appeared to be sweating, and its coal-black “frass” to be softer than heretofore, so I gave it some older growths of *Thymus* to eat, and allowed it plenty of exercise; when I again portrayed it on the 29th it measured, when fully stretched out, an inch and a half, and was stout in proportion. The lobes of the head were shining jet black, and between them, above the upper lip (also marked with black), was a triangular black spot; the papillæ greenish, tipped with black; the plate on the second segment was jet-black, with a very fine pale dorsal division; all other details as before.

By the 14th of October it had gradually become less dark in its general colouring, which now appeared of a dingy greenish-drab hue; it still fed a little at intervals.

On the 18th October, I put it in a flower-pot, on a growing plant of *Thymus serpyllum*.

At the end of March, 1883, I sought for the larva, and found it dead and rigid.

On the 6th June, 1883, I bought some eggs of *Agrotis cinerea*, 14 in number; they were laid on the 30th and 31st of May, on chip, in a group of eleven side by side, and another little group of three; they were ribbed and very much of a wax-like texture, and of a pale greenish-buff tint, each egg having near the top a fine ragged ring of dark greyish-brown not quite completed, and at the top a small central blotch of that colour. They continued thus until June 9th, when they had gained a slight increase of tint, and on the 10th they turned to olive-brownish, and on the 11th to a dingy purplish within the ring at the top. The ribs were now plainly visible. In the afternoon they became rather cloudy and indistinct, of a paler leaden-drab hue, and late in the evening six of them hatched, and three more by next morning, two in the afternoon, and the remainder next day.

The newly-hatched larva is dingy greenish-grey or dirty yellowish in colour, with blackish head and plate on the second segment, both shining, and shining black tubercular warts on the body, each with an extremely fine hair. They very soon began to feed, each larva gnawing away the under-surface from a leaf of *Thymus serpyllum*. By the 21st they had become of a greenish ground colour, the black dots, head, and narrow plate on the second segment still very distinct; and some of the larvæ are now laid up to moult. On the 22nd they began to moult the first time, and are now decidedly green, with all their black dots as before, with increase of stoutness; the green head strongly marked with black on each lobe and at the mouth; a mere outline of the plate on the second segment remains; a faintly paler green dorsal line can be traced, and two lines of rather paler green can be traced along the side. On the 29th and 30th

they *moulted a second time*, and were now of a deep green colour, with rather lighter green dorsal line, distinct from having dark edges; the shining head with a black mark on the lobes, the ocelli, and the mouth; the subdorsal line and the other below it now show faintly of lighter green, and the paler spiracular stripe is plainly visible, the raised black dots and hairs very much so. The larva is now 7 mm. in length. On the evening of the 5th July two had *moulted for the third time*, and the remainder by next day. From this time they began to thicken, and by the 11th showed a further moult to be not far off. On the 13th they were laid up waiting, and on the 17th ten had *moulted the fourth time*, and three were still waiting. On the 9th August the largest seemed preparing for another moult, and in the afternoon of the 13th it *moulted the fifth time*; two others were then laid up, and the rest were still feeding. Another made its fifth moult on the 16th, and others were laid up; one moulted a fifth time on the 17th, and one was preparing on the 21st. On the 29th the three smallest, a moult behind the others, died; and two others, of the same size and moult, died on the 3rd of September. The four survivors attained full growth, and were fine plump larvæ by the end of September; they continued to feed well up to the 10th of October, when one was found hibernating, not having fed for three days; two others during that time had fed but very little, and only one was still feeding well as ever, a ♀ as I suppose from its being the largest. I put them all four in a pot of *Thymus serpyllum*, prepared for them, and protected by wire gauze to prevent their escape. (W. B., 1882 and 1883, Note Book IV, 127-8, and 214.)

AGROTIS CURSORIA.

Plate LXXI, fig. 7.

This is one of the many species I owe to the kindness of Mr. C. G. Barrett, since he has turned his attention to the insect fauna of the coast of Norfolk.

On September 4th, 1869, he sent me a dozen moths (mostly females) alive; and in the course of a week some of them laid batches of eggs in little clustered groups of about forty or fifty, and also a few single ones scattered amongst the sand in their prison. These eggs I soon after conveyed to what seemed a promising spot for a future colony at a sand-hill on the coast, with the intention of looking after their larval produce in the following summer; but my friend spared me all that trouble by sending me a number of the larvæ, in different stages of growth, on June 11th, 1870, and a further supply on the 20th; these all fed well on *Arenaria peploides*, *Viola Curtisii*, *Triticum junceum*, etc., and became full-fed towards the end of June, when they burrowed deep into the sand for pupation, and the perfect insects made their appearance from the 1st to the 12th of August.

The egg of *A. cursoria* is rather small in proportion to the size of the moth, nearly globular, flattened a little at the base, very finely ribbed and reticulated, and of a flesh colour.

The larva when young is long and slender for an *Agrotis*; but, as it approaches half-growth, it becomes of tolerably stout proportions, and, when full-grown, is very decidedly plump. Its form is cylindrical, tapering a little at the first three segments, the head being the smallest, though full and rounded in outline; it tapers also on the two hinder segments; the segmental divisions and sub-dividing wrinkles are very well defined.

The colouring varies according to its size, but the head and the plate on the second segment are invari-

ably of a pale brownish-buff tint ; the general colouring of the body, up to more than half-growth, is a lively glaucous-green on the back, and rather bluish or greenish-grey on the sides, with the following details : the dorsal line is bluish-grey, outlined with dark-greenish-grey ; the subdorsal line is of a pale or whitish-grey, edged above with a strongly contrasting dark greenish-grey line ; midway between this and the spiracles, on the greenish-grey, rather transparent, ground colour of the side, there runs another line of pale whitish-grey, but undulating and interrupted in character ; beneath this again, as far as the spiracles, the ground colour is darker ; then follows a broad stripe of greyish-white, having a fine, dark, grey line running through it, the skin in this region being rather rugose : the belly and legs are rather pale greenish-grey ; the spiracles are black, and the tubercular dots dark brown ; the head and plate behind it are highly polished, and the rest of the body smooth-skinned and shining.

Soon after this period of half-growth, the larva comes to be parti-coloured for a time, the front segments remaining green, whilst a patch of ochreous tinges the back of the hinder segments ; by and by, this by degrees spreads below, and extends gradually forwards, keeping pace with the growth of the larva until it has attained its full size, when the whole of the body is of the same buff colour as the head, relieved by the whitish-grey lines before described, which are edged with short streaks of darkish-grey just at the beginning of each segment ; the tubercular dark brown dots are now very conspicuous.

The shape of the pupa is like that of many of its congeners, moderately stout, smooth, and rather shining, and of a pale golden-brown colour.

(W. B., May, 1872 ; E.M.M., IX, 14, June, 1872.)

AGROTIS NIGRICANS.

Plate LXXII, fig. 1.

On May 11th, 1865, Mr. Doubleday kindly presented me with some larvæ, which proved to be of this species; and to that gentleman I am greatly indebted for the following account of their destructiveness in a field of ten acres, which last autumn was sown with wheat, and with clover in the early part of this year; the clover came up well, and the field was green with it all over, until these larvæ began to attack it. So prodigious were their numbers and so great their powers of devastation that, by the 17th May, not a leaf of clover, nor even of any weeds, remained out of the whole ten acres, though the wheat was uninjured; and by that time they had left the open field and gone to the hedge-banks and ditches, where a remarkable scene of destruction presented itself to view. The large *Heracleum* and other umbelliferous plants were stripped of their leaves, and, in short, nothing was left but grasses, which they did not appear to touch.

I also received other larvæ of this species on the 14th May from Mr. Last of Ipswich, feeding on *Plantago major* and *P. lanceolata*, and he reported that they liked a change of food, and would eat many low plants; however, I found they took readily to clover, and, like those before mentioned, continued to feed to about the middle of June, the moths appearing from July 15th to July 24th, varying much in their appearance, and becoming active and restless the moment their wings were dry.

The larva when full-grown is an inch and a half long, smooth and cylindrical. The colour of the back is ochreous-brown, and in some individuals very bright ochreous; a thin grey dorsal line, margined with blackish, and running through a series of blackish-brown triangular and diamond shapes, well defined in some individuals, though obscure in others.

Subdorsal line greenish-black, in some varieties quite black, and edged below with a narrow line of dirty whitish-green, then a broad stripe of blackish-green, followed by another dirty whitish-green, narrow and slightly interrupted, line, and then another darker broad stripe of blackish-green, along the lower edge of which are the black spiracles. A double whitish stripe follows, extending down the sides of the anal pro-legs, which is made by a line of pale dirty greyish-green, being the colour of the belly and pro-legs, running through the middle of the white. The ordinary shining warty spots black. The head greyish-brown, mottled, and streaked with black. A dark brown shining plate on the back of the second segment, with three paler greyish lines.

Some of these larvæ presented great resemblance to several of the varieties of *Agrotis tritici*, but the double white stripe above the feet, and black warty dots, give distinct characters to the larvæ of *A. nigricans*. (W. B., E.M.M., II, 162, Dec., 1865.)

AGROTIS AQUILINA.

Plate LXXII, fig. 3.

Larvæ of this species, more than half-grown, were kindly obtained for me on the 15th May, 1865, by Mr. T. Last, a naturalist, of Borough Road, Ipswich, who informed me they were taken under tufts of the common plantain, and advised their having the narrow-leaved plantain as a change of diet; and from a later communication I learnt that they would eat various low plants, such as poppies, chickweed, knot-grass, and even onions, and that no *Galium* existed within half a mile of their locality, and that in rearing them in captivity, a change and variety in food-plants would be essential to their doing well. The few I had, however, did remarkably well on clover and *Plantago lanceolata*; they burrowed after the manner of many

of the genus during the day, and crawled forth to attack their food at night, and were full-fed by the 20th June, and the perfect insects emerged from July 24th to 29th, varying much in markings, no two specimens being alike, excepting in the general tint of warm brown, peculiar to this species.

The larva, when full-grown, is an inch and a half long, cylindrical, and rather shining. The head is grey-brown, mottled with blackish; the back dingy brown, a dorsal line of rather paler grey-brown, the subdorsal line black, edged below with a thin line of grey-brown, and which, like the dorsal line, runs through the blackish plate on the second segment; to this succeeds a broad stripe of dingy blackish-green, then another thin line of grey-brown, followed by another broad stripe of dingy blackish-green, the black spiracles being situated along its lower edge; the belly and legs grey-brown, the warty spots dark brown and not very conspicuous; the general aspect of the larva very dark and dingy. (W. B., September, 1865; E.M.M., II, 133, November, 1865.)

AGROTIS OBELISCA.

Plate LXXII, fig. 4.

I received, 5th June, 1870, from Mr. Wilson, of Edinburgh, eight larvæ, little and big, of an *Agrotis*, said to be *obelisca*. The smallest were very dark indeed, and had a pattern on the back of dark marks through which runs the dorsal line, thus : ☉.

Their natural food is asserted to be *Helianthemum vulgare*.

The ground-colour of the back is greyish-brown, the sides of a smoky or blackish-green. The subdorsal stripe is rather broad and dark blackish-green, the dorsal line pale grey, outlined with blackish-green; properly speaking, the subdorsal line is thin, of pale greenish-grey, and edged above broadly with the dark

blackish-green stripe mentioned above. Along the middle of the side runs in an undulating manner another pale greenish-grey line, somewhat interrupted and irregular as to its thickness, and at some distance below, immediately beneath the black spiracles, is a broad stripe of dirty-whitish, having a fine line of smoky blackish-green running through the middle of it. Belly uniform pale smoky-green. Tubercles dark smoky-green and shining, spiracles black. The ground of the back is finely freckled with darker atoms. The head is smoky brownish, freckled with darker, and its lobes streaked with darker; the plate of second segment very shining dark smoky blackish-brown, the pale dorsal and subdorsal lines distinct on it. Tubercular warts shining. The segments rather deeply wrinkled.

On the 16th of June, I was delighted to see the wonderful change that had come over these larvæ; both big and little were arrayed in attractive colours. The ground colour of the back is now a flesh colour or pinkish-ochreous, the dorsal line passing through a pear-shape of pinkish-bronze or pinkish-grey, with dark freckles, the small end of the pear behind; the sides dark pinkish-grey with opaque whitish ragged lines below the spiracles, and the whole of the belly and pro-legs opaque white, rather shining, and having a lovely opalescent gleam of pinkish on this and all over the body.

By the 25th of June these colours began to disappear, and to be replaced with others of a very dull and plain character. (W. B., 1870, Note Book I, 3, 4, 16, 17.)

AGROTIS RAVIDA.

Plate LXXIII, fig. 3.

By the kind efforts of Mr. Doubleday, to whom I feel greatly indebted, I have had the great satisfaction of rearing and figuring larvæ of this species. They

are to be found in soils congenial for their burrowing, just below the surface, chiefly at the roots of thistles and dandelion plants ; being full-fed from the beginning to about the 20th of May. I found them feed freely on the large milky leaves of dandelion, and change to pupæ in loosely-constructed cocoons of earth from the 6th to the 20th of May. The larvæ presented three varieties of markings on the back, of a character such as I have never before met with.

Var. 1. Larva yellowish-brown, slightly tapering near the head, but almost of uniform thickness, and cylindrical ; a thin dorsal line slightly paler than the ground colour, and running through a dusky v-like streak at the end of each segment after the fourth. At the commencement of the fourth segment, on each side, and close to the division, is a subdorsal ochreous-yellow spot, which, on the fifth to the eleventh, inclusive, has an almost confluent yellow wavy curved streak, extending along two-thirds of each segment, becoming less curved towards the twelfth, on which they are straight, and slightly converging at the end of that segment, where they are margined above with dusky brown wedge-shaped streaks pointing forwards, and a dusky edging above to the curved yellow streaks, but gradually less intense towards the head on the other segments.

The sides and belly, with legs, brownish-grey ; a paler greyish stripe freckled with dusky atoms above the feet ; immediately above that are the spiracles, minute and dirty white in a dusky blotch, which emits an oblique dusky streak, extending to the subdorsal marking of the segment in advance. Head grey, mottled and streaked on the lobes and face with dusky brown ; a dull brown plate on the second segment, with slight indications of dorsal and subdorsal faint lines through it.

Looking on the back of this larva, the yellow marks on each side are suggestive of a series of incompleted horseshoe shapes.

Var. 2. Ochreous-brown on the back ; the paler dorsal line after the fourth segment only visible at the divisions ; the V-like streaks from them being longer and darker than in the first variety. The yellow spot on the anterior portion of each segment on either side the back, isolated from the yellow subdorsal streak by a very dark brown, rather broad, edging to the yellow streak, and extending with it along two-thirds of each segment after the fourth to the eleventh, and on the twelfth to the end of the segment, converging a little at the extremity ; and on these the yellow marks are broad and straight, but those on the third and fourth segments are curved, and without the dusky brown border above. A dark brown plate on the second segment. Head pale grey, streaked and mottled with dusky brown. Belly and sides similar to the preceding.

Var. 3. Dingy ochreous-brown on the back, and darkest towards the head ; the slender and slightly paler dorsal line hardly visible, and only at the segmental divisions.

On each side of the back, in the subdorsal region, at the anterior of each segment, and beginning at the fifth, a dingy ochreous spot and curved streak, becoming confluent at the eighth and three following segments (on the twelfth the streak only visible) ; each yellow curved streak edged above with a thin black streak, and extending two-thirds down each segment ; the spaces on the middle of the back between the streaks being filled up with dark brown, and two minute dusky dots edged with paler in the upper portion of these somewhat square dark forms. The curved yellow subdorsal streaks slightly marked on the second, third, and fourth segments, and the yellow spots also on the fourth. Head dingy brown ; the sides dingy brown, with a paler greyish stripe above the feet, anteriorly edged above with dusky, and oblique streaks above it, as in Var. 1, but not so well defined. The anal segment in each of the larvæ plain dingy

brown. The moths appeared on July 8th, 1865. (W. B., E.M.M., II, 115, October, 1865.)

TRIPHENA SUBSEQUA.

Plate LXXIV, fig. 4.

On September 6th, 1871, Mr. George Norman, of Forres, most kindly sent me some eggs laid by a female of this species. The larvæ began to hatch on the evening of the 13th; on the 23rd they moulted; by October 14th they were five-twelfths of an inch in length, and growing fast, so that by the 20th they were five-eighths of an inch long; after this, most of them ceased feeding for hibernation, but some went on till full growth, moulting for the last time during the latter part of November, becoming full-fed from the 16th to 27th of December, and pupating shortly after. The hibernating larvæ did well enough whilst the weather was mild, and fed a little, and got through a moult in January, 1872; but, on the 29th of that month, a severe frost killed most of them, and the survivors perished in a similar way on February 21st.

I sent some eggs to Mr. Hellins, who managed to bring three larvæ through hibernation, keeping them in a cucumber-frame without bottom heat; but he bred only one moth (June 12th), the pupa state having lasted four or five weeks.

The food the larvæ chose at first was cowslip, garden riband-grass, and *Ranunculus acris*; after a time they seemed to prefer *Potentilla reptans* and *Ranunculus repens*, and on this last they fed up; Mr. Hellins tells me his larvæ stuck to the riband-grass throughout.

The egg, as with other species of this genus, was small, somewhat globular, but rather flattened above; the shell glistening, with thirty blunt ribs, and faint reticulations; the colour at first dirty white, and in four days there appeared a greyish-brown blotch

on the apex, and a zone of irregular blotches round the middle ; just before hatching, the colour was pale grey.

The young larvæ were at first of a semi-pellucid greenish-grey colour, with a brown head, and an internal brownish-green vessel, all the usual warts very conspicuous, and bearing each a bristle. In ten days they had moulted into opaque, brownish-grey coats, having a stripe of cream colour above the legs ; at their next moult, when from three to four lines long, they were of similar colour, the dorsal and subdorsal lines becoming faintly visible, the former as a pale thread running down the centre of a brown stripe, the latter as a fine line rather paler than the ground, and edged above with a thread of darker ; the lower stripe above the legs much paler than the ground colour. In three weeks more they were five lines in length, and stouter in proportion than before, and now showed the dorsal stripe white running uninterruptedly through oval shapes of brownish-grey, darker than the ground colour, the subdorsal stripe as before, and the pale subspiracular stripe having a fine line of white on its upper edge. These details, even at this early stage, effectually distinguish this species from either of its congeners. Another week of growth brought them up to five-eighths of an inch in length, and they were now generally of a little deeper tint of greyish-brown, the dorsal white stripe still the distinct character, running now through elongated diamond shapes, darker than the ground colour ; the subdorsal stripe a little less white, with a series of oblong black dashes along its upper margin ; just before the last moult the whitish stripes assumed an ochreous-yellow tint, and the whole ornamentation generally came very near to the appearance of the full-grown stage—now to be described.

The full-grown larva is one inch and a half to one and five-eighths inches in length, of stout proportions, cylindrical, and of tolerably uniform bulk throughout,

tapering a little from the fifth segment to the head, which is a trifle the smallest ; and the thirteenth segment tapers also a little, and is rounded off behind ; the segmental divisions are slightly indented ; the smooth skin has a velvety appearance. The ground colour is greyish-brown or pale drab ; on the back of each segment is a much darker and rather olive-tinted mark of a diamond shape, with the points truncated ; through the middle of this row of diamonds runs the very conspicuously wide dorsal stripe of bright ochreous-yellow, which at each end of the body becomes narrower, and is relieved throughout by a very fine black edging ; sometimes a faint cloud of greyish appears in the middle of this dorsal stripe, but this is oftener met with in the earlier stages ; the subdorsal stripe is almost as wide as the dorsal, but is rather more of a greyish-yellow, and clouded faintly with greyish along the middle, and it is well relieved on its upper and lower edges by a thin darker line ; close along the upper edge, in contact with it, is a series of oblong, square black marks, each mark situated on the anterior portion of a segment, those on the third and fourth segments being narrower than the rest and rather wedge-shaped, that on the twelfth extending the whole length of the segment ; the tubercular marks on the back are black, and three on either side of the dorsal stripe in each segment and in the post-thoracic segments are thus arranged :—the middle one of each three is seen as a dot, sometimes faintly confluent longitudinally, and the other two are merged within transverse narrow bars of black, the one in front at the segmental division, the other behind the square black mark previously mentioned, only the slenderest interval of the pale ground colour separating them ; adjacent on the back, near the segmental divisions, are a few fine longitudinal streaks of greyish-yellow : the ground colour of the side, as far as the spiracles, is the same as that of the back, with a darker longitudinal stripe running midway through it,

more strongly tinged with darker brown at the beginning of each segment; the very broad subspiracular stripe is pale ochreous at its upper and lower edges, rather greyish-ochreous along the middle, bearing a couple of brown freckles on most of the segments; the upper edge of this stripe is well defined by a very fine brown line, on which are the spiracles, small and white, either simply outlined with black, or placed in fusiform black blotches, which gradually increase in size to the twelfth segment; the belly has a faint, indistinct, central, paler longitudinal line, and a few freckles of the same paler tint, but its general colour, as well as that of the legs, is a little deeper in tint than the subspiracular stripe; the ventral legs bear a couple of small brown dots, and are tipped with hooks of the same colour; the head is brownish-grey, freckled with dark brown, and marked down the front of each lobe with a black wedge-shaped mark, pointing to each side of the mouth; the sides of the head bear also a black streak.

It will thus be seen that this larva is a much handsomer creature than either of its congeners in this country, and abundantly distinct from them.

The pupa-state was assumed at a slight depth below the surface of the soil, and there seemed to be little appearance of any cocoon or chamber; the pupa was full and rounded in figure, the skin being thin and of a bright red colour. (W. B., July, 1872; E.M.M., IX, 56, August, 1872.)

TRIPHÆNA ORBONA.

Plate LXXIV, fig. 5.

This larva is of a pale ochreous-greyish tint on the belly, with a central oblong broad spot on the fifth and sixth segments. The surface is freckled with grey-brown. On the side immediately below the sub-

spiracular broad stripe is an equally broad stripe of a little deeper ground with darker and thicker freckles, and a blackish spot. A blackish spot is also on each ventral leg. (W. B., 1872, Note Book I, 165.)

TRIPHÆNA PRONUBA.

Plate LXXV, fig. 1.

On the 28th of August, 1873, I received from Mr. W. H. Harwood a batch of eggs laid round the flower-stalk of an umbel of *Silene pratensis*. They were closely laid together in even rows embracing the stalk, which was covered with them for about three-quarters of an inch in length, and for a quarter of an inch round two of the foot-stalks. Each egg was circular, rather flattened above and below, strongly ribbed and reticulated, and when they arrived were a pale drab colour, blotched above in the centre with pink; in two days the pink had gradually spread over the rest of their surface, and on the 1st of September they changed to greyish-pink, and to a leaden-grey on the 2nd, but glistening as when first they arrived; on the 3rd they all hatched, and at first the young larvæ were but little more than one-sixteenth of an inch long, with large dark brown head and plate behind it; the body brownish-grey, with minute blackish dots, each bearing a fine dark hair.

After twice moulting I began to identify them, and by October 20th they were all of the ordinary dark grey-brown forms, and were sent adrift.

On 16th September, 1874, six larvæ arrived from Mrs. Hutchinson, which she had reared from eggs laid on a reed stem about a fortnight previously at Wicken Fen. Some of the eggs had hatched during the journey to her, and she had kept the young larvæ on *Triticum repens*, and they had moulted once only before they were sent to me to be named.

On reaching me the larvæ were three and a half

lines in length, of a light rather greenish-drab colour, and on the 18th they moulted, and ate freely of knot-grass as well as plantain. Before moulting I had observed that they had a paler subspiracular stripe, and now, after their moult, this was very distinct, and their backs were green, having paler, almost whitish, dorsal and subdorsal lines, these last the thickest, and both of them finely edged with darker glaucous green than the ground; a darker glaucous green freckling ran along the spiracular region; their heads a pale greenish-brown. They all by degrees grew paler, and their lines indistinct as they drew near another moult, which was accomplished on the 23rd and 24th, when they were now half an inch long, and their characteristic dress appeared for the first time—an appearance only too familiar to those who have paid much attention to larvæ. This dress of course was only somewhat rudimentary, but the subdorsal line having a faint clouded central streak through it, and a darker mark above it at the beginning of each segment was quite sufficient for their satisfactory identification. On the 27th and 28th they moulted again; though greenish at the time of casting their skin, yet in half an hour their colouring was grey, the head remaining pale green some hour or two longer, when it also began to grow a little greyish-brown, and to show a darker streak of reticulation down the front margin of each lobe; the black dashes along the upper margin of the subdorsal pale stripe being very strongly marked; twelve hours later their grey colouring changed to brownish-grey. On the 29th and 30th, and 1st of October they again moulted, one of them nearly black, one light green, the others pearly-grey at first turned rather pinkish-grey, and after moulting, they were about an inch in length, and stoutish in proportion. On November 15th they were all dead but one, from some disease which turned them black and rotten. The sole survivor on the 25th changed to a pupa. (W. B., 1873, Note Book II, 132.)

On the 25th August, 1882, I received from Mr. Wm. R. Jeffrey three groups of eggs laid on the upper side of part of an oak leaf, the other parts of the leaf having four or five times as many, and those sent to me numbered about 122. The eggs were laid evenly and close together side by side, and were of an almost white colour when gathered from the tree nearly a week since, and before I received them they had changed to a deep dull pink, and this seemed to deepen a little daily up to the morning of the 30th; a few hours later they changed to a light violet hue, and in the evening of that day they began to hatch.

The shell of the egg is globular, having an embossed central ring at top, from which the surface is numerously ribbed, and very dull.

The newly-hatched larva is apparently a semi-looper, but has sixteen legs, and is of a pinkish-grey colour, apparently transversely banded with darker grey while walking. The head is black, and a narrow blackish plate is on the second segment; a broad dorsal vessel of dark brownish-grey, minute dark dots with black bristly hairs; they were placed on oak, but did not eat, and all died in a day or two. On the 28th of September I received about thirty larvæ which Mr. Jeffrey had saved from a part of this same brood by feeding them with birch; some of the larvæ were now about four to five lines long, evidently *Noctuæ*, and brownish in colour; they had completely skeletonised the birch leaves that came with them. On measuring one of them I found it to be just five and a half lines or 10 mm. long, and rather slender for a *Noctua*; its ground colour is rather pinkish-brown above, on back and sides finely mottled with paler; a darker brown dull plate is on the second segment, through which pass the dorsal and subdorsal lines; the dorsal line is cream colour, very thin, and margined with dark brown beyond the plate; the subdorsal is a wider line of the same cream colour through the plate, but beyond is

rather of a light greyish tint, finely edged above and below with darker brown; beneath this the ground darkens, and is then well relieved with the spiracular stripe of pale brownish-buff, edged above and below with paler cream colour; the belly and legs paler than the back; the head is cinnamon-brown, and rather glossy. At this early age the identity of the larva cannot be mistaken, from the subdorsal line being clouded in the middle with greyish. On the 2nd of October most of them had become very pale and watery-looking, many laid up and waiting to moult. In a day they began to moult, probably for the third time, as the characteristic markings appeared, which are just the same as in the adult, and at this stage, after seeing them eat with avidity a leaf of *Galeobdolon luteum*, I was content to give them all their liberty. (W. B., 1882, Note Book IV, 172.)

NOCTUA DITRAPEZIUM.

Plate LXXVI, fig. 2.

On the 24th of July, 1878, I received from Mr. Wm. Herd, of Scoonieburn, Perth, a batch of eggs of this species just on the point of hatching, which commenced immediately.

The shape of the egg is round and domed above, flattened and depressed beneath, ribbed and reticulated; when first laid they were whitish, and lastly pale grey, showing a dark grey spot at the top; in this state they began to hatch.

The young larva eats out rather a large hole for its escape from either the top or side of the shell, and in many instances makes its first meal on the shell itself. The larva at this time is of a faint semi-pellucid greenish or drab tint, altogether very glittering; the head blackish, with paler mouth, and a small darkish-brown plate on the second segment, and by the help of a lens

minute dusky dots can be discerned on all the other segments of the body. After the first moult they were darkish-green or slaty-green, and rather velvety, with dark shining blackish heads. By the 9th of August, after another moult, they were darker on the sides than on the back, and of a dingy-greenish colour, with faint dotted or broken dirty-whitish dorsal and subdorsal lines; feeding well on dock and sallow. By the 23rd, after another moult, they had become brown with darker brown side bands and dorsal somewhat diamond-shaped marks down the back, one on each segment; the dorsal and subdorsal dotted lines of creamy-whitish still more conspicuous (I sent eighteen to Mr Jeffrey, and twelve to Mrs. Hutchinson). From this time I continued to supply them with similar food until the sallow began to fail, and then I resorted to bramble leaves, which from former experience I knew to be their natural food, during the winter and early spring months, supplementing them with a few dock leaves when they could be found. The winter proving unusually and severely cold, they slept contentedly through all the long-sustained cold periods, and whenever a milder interval came I provided more bramble, which they ate, and thrived gradually, not a single death happening all through the winter. In March they began to be more awake, and one or two at a time began to moult, and fresh dock leaves were often added to their fare of bramble; and through April they began to feed, grow, and moult, and by the beginning of May, 1879, a few had acquired their full growth. Occasionally, a little fresh hawthorn and young sallow leaves were added to their fare, and towards the end of the month they became full-fed, burrowing in the earth a few at a time from the 10th to the 29th of May. Just before this time three or four deaths occurred amongst them of individuals that had lost appetite, lagged behind the rest, and had not performed the last, nor, perhaps, the penultimate moult, though they lingered on alive, apparently

without eating, until the latter part of May, and the last of these individuals did not die before the 3rd of June.

The full-grown larva is from one and a half to one and five-eighths of an inch in length. (W. B., 1879, Note Book III, 241, 247.)

NOCTUA CONFLUA.

Plate LXXVII, fig. 2.

Eggs and one young larva hatched received from Mr. Longstaff, August 26th, 1869, from Forres, N.B. The egg is at first a dirty yellowish-white, soon changing to pale whitish-grey, having a zone round the middle, and a blotch of pale brown on the upper surface, some having splashes of brown. Its shape globular above, but flattened beneath.

By August 30th, I found I had four young larvæ about one-eighth of an inch long, extremely pellucid and shining, rather thick in proportion to length; the head black, a blackish-brown plate on the second segment, the dots small and blackish, each with a hair; the body dirty greenish and translucent, the interior showing through the skin as a dark slaty-green internal stripe. They fed readily on knot-grass and dock. By the end of September I found only three larvæ, and soon after this date their transparent look disappeared, and they became of a light greyish-buff colour on the back, and greyish-brown on the sides; the pale subdorsal line finely edged above with a thin thread of black. Their growth was very slow, and they ate but little; at the end of December they were about half an inch long, and stout in proportion. (W. B., 1870, Note Book I, 24.)

Eggs from Mr. Norman at Forres, July 17th, 1870. The egg is whitish-flesh colour, with a pinkish-brown blotch at the top, and a zone of the same colour round

the middle; the shape is globular, just the least flattened beneath.

On the 20th August, passing over the earlier stages, which I noted last year, I resume a description of the larva at half an inch in length. It is darkish-brown on the back, and darker brown on the sides, with some faint traces of the dorsal line, and the subdorsal one whitish and very distinct, an obscure black edging above it, and a cream-coloured stripe beneath the spiracles.

Mr. Norman sent me several batches of eggs, but I here describe the larvæ of the third batch first. The eggs came on 27th July, and hatched on the 31st. Mr. Norman, in his letter from Forres, dated 25th July, says: "Pardon me for sending *conflua* again. They are from very pretty parents, quite different in colour from the former."

Now the larvæ from these eggs, although much like other *N. conflua* when very young, yet nevertheless soon began to look rather different from the other broods of this species, chiefly in showing the dark subdorsal dashes at an earlier stage than usual, as well as in being thicker also. Another circumstance to be mentioned is that though treated like all the other broods, yet they matured in several instances much earlier than the others, and one of them pupated on the 3rd of October, and others at intervals, and by the 2nd of November as many as twelve had entered that stage. The full-grown larva is very plump, the largest segment being the twelfth, and the head the smallest, the thoracic segments tapering towards it when stretched out; at such times, it is one inch to an inch and one-eighth in length. The ground colour of the back and sides is purplish-brown, palest on the back; the pale dorsal line of this colour is but faintly visible here and there, chiefly towards the ends of segments, for the two blackish-brown lines that enclose it seem much run and fused together. The subdorsal line is white, or whitish, but is very fine and thin,

bearing a thick black wedge-mark above it, on the front of each segment; these marks are remarkably thick, beginning on the fifth and ending on the twelfth segment, where their outer sides are decidedly concave; a diamond shape of dark purplish-brown is in the centre of the back of each segment; its anterior portion, as far as the ends of the black wedges, is of a still deeper purplish-brown; a fine streak of white at its beginning from the outer end of the black wedge-shape flows round its base, and slants obliquely inwards, rapidly melting into the ground colour. The space from the subdorsal line to the spiracles is purplish-brown, its upper half the darkest; from thence at the beginning of the lower half at the front of each segment is a blackish oblique streak slanting backwards to the black spiracle. The subspiracular stripe is of yellowish-grey tinged with brownish along its middle, its edges yellowish-white; an inflated semi-circular pale greyish spot is below its lower edge in front. The belly and pro-legs brownish-grey. The head dark shining brown; all the other parts of the back and sides are velvety. The plate of very dark brown on the second segment is also velvety. The thoracic segments are darker than the others. The tubercular dots on the back show white for the first pair, often situate on the black wedges; the hinder pair are inconspicuous immediately behind their broad ends.

Their food is chiefly dock and bramble. The first moth, a female, appeared on the 5th of December; the inner half from base and also the subterminal borders of a bright bluish-grey, the rest rich chestnut-brown. (W. B., 1870, Note Book I, 24, 38, 62.)

NOOTUA DAHLII.

Plate LXXVII, fig. 3.

On September 11th, 1868, I had the pleasure to receive from Mr. G. B. Longstaff an abundant supply of eggs of this species, that had been obtained from several females in captivity by Mr. G. Norman, in Morayshire.

The eggs were dome-shaped, flattened, and slightly concave beneath, ribbed and reticulated, of a drab colour, with a central zone of brown; in a few hours after I had them they turned to a brownish-slate colour, and the larvæ began to hatch on the 13th September and were all out by the 15th.

The young larvæ were at first a brownish-grey colour, with black heads, and they soon began to eat the green cuticle from either surface of leaves of dock, *Rumex crispus* and *R. pulcher*, showing a most decided preference for these plants, though supplied with various other kinds of food.

After their first moult they became a paler brown, with their minute tubercular blackish dots and hairs distinct; and by the time they had passed a second moult, they were three-eighths of an inch long, brown on the back with faintly paler dorsal and subdorsal lines, the sides down to the spiracles of a rather darker brown than the back, the ventral surface and subspiracular stripe paler brownish-grey tinged with bluish-grey anteriorly.

These larvæ when about one-third grown were handsomer than at any other period, their colours being then deeper and brighter. The full-grown larva is from one and three-eighths to one and half an inch in length, longer perhaps when fully stretched out, and then it also tapers from the sixth segment to the head, which is narrower than the second segment; the thirteenth also tapers and slopes down from the

back to the anal extremity; otherwise the figure is tolerably cylindrical.

The great feature in the colouring of this species is the contrast of the back with the rest of the body, and, although the pattern was very much the same throughout the numerous brood which I reared, yet I noticed great variations of colour—from whitish-ochreous—through greyish-ochreous, ochreous-yellow, cinnamon-brown, rich orange-brown, to the deepest tint of mahogany on their backs.

I shall describe one of the varieties as typical of the greatest number. The ground colour of the back down to the subdorsal region, bright ochreous, delicately freckled with darker ochreous-brown; on each segment from third to twelfth, more or less distinctly appears a diamond shape of ochreous-brown, with its edges gently vanishing into the ground colour; the dorsal line is of the ground colour between two lines of very dark brown, though in full grown examples it is seldom uninterrupted, being visible only at the beginning of each segment, and thence obliterated by the brown diamond.

The subdorsal line is thin, rather paler than the ground colour, edged above at the beginning of each segment with a thin black streak, which is generally inclined to end in the slightest possible curve just at the lateral point of the dorsal diamond: this diamond form is but obscurely and vaguely represented on the third and fourth segments, and the last of the series is on the twelfth, where it becomes little more than a triangle, while the pale subdorsal lines and their black upper edgings are there continuous, and become united by both crossing transversely the end of that segment; on the thirteenth segment the dorsal line only is distinct.

The ground colour of the sides is grey or brownish-grey, tinged anteriorly with bluish-grey, the space between the subdorsal line and the spiracles very thickly freckled with dark grey-brown, forming a dark

longitudinal side-band in agreeable contrast to the back; the subspiracular stripe is pale greyish, like the ventral surface, and only to be distinguished from it by its upper and lower edges being a little paler than the rest.

The head is rather pale brown; the second segment has on the back a darker brown velvety patch or plate, rounded behind and margined in front with still darker brown. The tubercular dots are black, rather small, but rendered conspicuously distinct both on the back and sides by a small circle of pale ground colour surrounding each of them; the spiracles also are black.

The winter of 1868-69 being of a mild character, and the food-plants easily obtainable, about sixty of these larvæ continued feeding, and reached their full growth before the end of 1868; the most advanced spun up between dock leaves on November 14th, and others quickly followed; somewhat to my surprise they refused to enter the earth, but, on being supplied with moss, for the most part hid themselves in that, constructing very slight cocoons.

The pupa is quite of the ordinary *Noctua* form; at first it is a pale greenish colour, and changes in a couple of days to brown, and finally to dark brown, and is very slightly attached by the tail to a thread of its cocoon. This portion of the brood, having all become pupæ by the end of December, did not remain long in that state, but began to appear as moths as early as January 19th, 1869, and so on at intervals, until April 29th, by which time I had bred twenty-six ♂ and twenty-seven ♀; however, a large proportion of them were more or less crippled in their wings, and very dingy in colour, though some curious varieties occurred; but, as a whole, they were not fine examples.

The remainder of the brood meantime had hybernated, some of them no more than two lines in length, others nearly half an inch, and many of them died off during the winter; but on the approach of April the

survivors began to feed, and by the 10th of May they were full-grown ; they also preferred spinning themselves up in moss or in dock leaves to entering the earth.

The perfect insects, and they really were very perfect and fine, forty-five in number, appeared at intervals between June 4th and July 11th. (W. B., February, 1870, E.M.M., VI, 261, April, 1870.)

NOCTUA BELLA.

Plate LXXVIII, fig. 1.

The larva was figured March 2nd, 1874.

Towards the end of September, 1873, I received a young larva of this species, no more than four-sixteenths of an inch long, from the Rev. H. Williams, of Croxton, who had swept it from heather. It continued to eat heather and a little dock until the end of November, by which time it had become half an inch long, having moulted once in the interval. From this time it began to hybernate, though at intervals of milder weather it waked up and ate occasionally of grass, dock, and lettuce, and became five-eighths of an inch long by February 12th, 1874. On the 22nd of February it again moulted, and thenceforward fed well on dock and grass, attaining by March 9th the length of one and three-eighths inches.

It was then cylindrical, moderately stout, and tapering gradually from the sixth segment towards the head, which was the smallest segment. The hinder segment tapered a little towards the extremity. The ground colour was of an ochreous or brownish-drab, much striated with darkish-brown on the back, and the dorsal fine thread-like line of drab is enclosed by a blackish-brown stripe or bordering. The sub-dorsal fine line is of the same drab ground colour, running between two widish blackish-brown stripes ; it is a little interrupted on each segment, and these

double dark stripes are repeated along the side with a similar fine drab line running through them; along the middle space of the side it is much freckled with blackish-brown. The spiracles are blackish with drab centres, but hardly to be noticed, as they appear black to the unaided eye; immediately beneath them was a stripe of pale drab, paler still at its edges, and freckled and streaked along the middle with greyish-brown. The belly is brown, freckled with minute atoms of drab; the plate on the second segment is not shining, but pale brown, sparingly freckled with darker. The whole skin of the rest of the body is rather soft and velvety; the head is of a warm brown, with a blackish-brown stripe down the front of each lobe, and is very shining; the anterior legs are brown, and the ventral legs rather a pale brown tipped with darker brown hooks.

This larva ceased to feed on March 24th, and spun itself up in a dock leaf on the surface of the earth on the 26th, and the moth, a female, appeared on the 27th May, 1874. (W. B., 1874, Note Book II, 53.)

NOCTUA UMBROSA.

Plate LXXVIII, fig. 2.

The larva of this species having eluded the search of myself and many of my friends for a number of years, a belief gained ground with us that it probably closely resembled that early pest *N. xanthographa*; and this belief was strengthened three or four years ago by the fact of Mr. Harwood having bred one specimen of *N. umbrosa* from a lot of larvæ which he had collected as those of *N. xanthographa*.

I have at length been able to prove our surmise to be correct, thanks to Mr. George Norman, to whom I feel deeply indebted for his taking much pains in obtaining and sending me from Forres, three separate batches of eggs of *N. umbrosa*, on July 27th, 28th,

and 30th, 1870. From them, the young larvæ began to hatch respectively on August 3rd, 5th, and 11th. At first, grass was provided for them, but they refused to eat, and some of them died. I then supplied them with dock leaves, and thenceforth all went well; they fed and throve satisfactorily; but towards the end of November, dock began to fail, and the few leaves I could then obtain were supplemented with bramble, of which the larvæ partook freely. My chief object being to obtain figures of the larvæ, I did all I could think of to force them on to full growth, and succeeded with some of them by feeding with *Plantago lanceolata*, *Galium mollugo*, *Vinca major*, and garden-strawberry leaves, all of which they ate at intervals, when the rigour of winter in the least abated. At length the Periwinkle became the only food procurable, and on this they did very well, for even while the snow lay on the ground, the leaves of this plant continued green and succulent; thus, between the intervals of hard frost, the larvæ crawled out of their temporary hybernacula of curled-up, dry bramble leaves, and partook of their food. Of course, they were not kept in the open air, but in a room without a fire, so that at no time were they exposed to frost.

Towards the end of February and beginning of March, 1871, young dock leaves began to appear, and with an increase of temperature, the larvæ became more lively and hungry; the smaller ones, whose coats had become dingy, now molted and fed, while the others that had reached their full growth about Christmas began to stir and show symptoms of approaching pupation; they grew smaller, their colours merged into a darkness, which spread over them as they retired into moss; several of them becoming pupæ between February 27th and March 11th.

The others continued to feed chiefly on dock, with a little of *Scrophularia aquatica*, and attained their full size the first week in April; they then, however, like their predecessors, began to dwindle, and became

darker and darker till they were blackish-brown. A few entered the earth, the rest went into moss, where they assumed the pupa state, but without forming any cocoon in either; though those in the moss appeared to be steadied in their positions by a slight thread or two. The moths appeared from June 8th to 13th.

The egg is circular, domed above and flattened beneath, finely ribbed and reticulated. When first laid, it is of a yellowish-white colour, and changes in six days to a glistening pink, and finally to pinkish-grey.

The young larva, when hatched, had at first a pale brown head, and greenish-grey body, paler and pellucid at the segmental divisions; in eight or nine days they were pale, semi-transparent, yellowish-green, with distinct black dots. At their next change, at the end of another week, they were three-eighths of an inch long, and not translucent, but with a suffusion of opaque-brown over the back and sides, giving them a velvety brownish-green look; and there then appeared dorsal, subdorsal, and lateral lines, paler than the ground; between the lateral line and spiracles the space was filled with a darker tint of the ground colour, forming a broad dark stripe. At this stage the character of *N. umbrosa* is very distinct from its congener, and remains so until the length of about five-eighths of an inch is attained; but the next moult introduces the design that at once recalls the well-known *N. xanthographa*, and continues throughout their future larval career.

There were three varieties of the general colouring in each of the three broods, some being yellowish, some brownish, and others of a greyish-brown, but in the detail of their markings they were all very constant. The individual from which the following description was drawn was one of the yellowish varieties:

The full-grown larva is from one and a quarter to one and three-eighths inches in length, moderately stout and cylindrical, though tapering a little at the

anterior segments, the head being smallest, the last segment also sloping down on the back from the twelfth, and tapering a little to the extremity. Viewed on the back, the colour of the head is pale brownish, freckled with darker brown, and streaked with brown on the front of each lobe, and very shining; the skin generally smooth and rather velvety on the rest of the body, though a little shining on the back of the second segment; the dorsal line is very pale whitish-ochreous, edged with a dark brown line on each side; it is not quite a simple line, but commencing broad on the front of each segment, soon narrows, expands again just at the middle, again contracts, and widens again at the end; the subdorsal line is of uniform thickness throughout its course, and is also of the same whitish-ochreous tint, edged on its lower side with a fine dark brown line, and on its upper side by a wider brown stripe, bearing a black dash, sometimes rather of a wedge shape, on the anterior half of each segment; the ground colour of the back between the lines is ochreous or brownish, marked with fine longitudinal dark brown wavy streaks, which are variously disposed in their aggregation, sometimes suffusing the ground colour in a narrow diamond form; in other examples more suffused behind, but generally these streaks give more depth of colouring at the anterior part of each segment; the front pairs of tubercular dots are black, and they often send forward a fine black streak; the hinder pairs are also black, but, from standing within the before-mentioned black dashes, are invisible; the twelfth segment has the subdorsal lines slanting inwards for two-thirds of its length, where the last pair of the black dashes end abruptly, as do also the suffused, wavy streaks, and from that part the subdorsal lines bend outwards, and resume their former course, approximating towards the end of the dorsal line at the anal extremity; the colouring of the side, as far down as the spiracles, consists of two longitudinal broad bands or stripes of equal width through-

out, the upper being pale ochreous (sometimes bearing a few brown scattered freckles), the lower dark brown, containing a slanting dash of still darker brown made up of atoms; on the lower edge of this come the spiracles, which are not very conspicuous, being small dirty whitish, outlined faintly with black. The subspiracular stripe is of pale unfreckled ochreous, and is attenuated a little at each end; the belly and legs are of a very slightly deeper tint of the same, and there are some minute tubercular dots and freckles of dark brown above and upon the legs, which are tipped with dark brown.

The pupa is about half an inch in length, moderately stout and smooth, with no striking peculiarity of form, dark brown in colour, and rather shining. (W. B., September, 1871, E.M.M., VIII, 139, November, 1871.)

NOCTUA SOBRINA.

Plate LXXIX, fig. 1.

On the 15th of August, 1874, I received from Mr. John T. Carrington, then at Camachgouran, Loch Rannoch, Pitlochry, N.B., fourteen eggs of this rare species, deposited on August 1st. by a female taken in copulâ. Two of them were not fertile. The eggs were loose in a piece of quill.

The egg is globular, having a small depression at one end, and about thirty ribs. On arrival the eggs, with the exception of two of a bright pale yellow, were of a rather deep flesh colour; these on the 21st had become pinkish-brown, on the 22nd of a blackish-purple. On the morning of the 23rd three young larvæ were hatched, and seemed strong and active. Their heads were shining blackish-brown, their bodies purplish-brown, darkest on the back within the subdorsal region, and with a plate of darker brown on the second segment. By the 28th, eleven eggs out of the twelve were hatched, one having failed.

The young larvæ were at first provided with heather, bramble, and bilberry in a bottle, but they chose heather, on changing which one larva was lost, and another found dead at the bottom of the bottle. My stock, thus reduced to nine larvæ, fed chiefly on the heather and on knot-grass, and a little of the green cuticle of a soft leaf of young birch, still rejecting the bilberry. On the 31st they had become of the same green colour as the heather, but semi-transparent with minute blackish dots and hairs and brown heads. On the 12th of September, I found two had moulted, and others were preparing. The new dress consisted of a dark brownish-olive opaque-surfaced dorsal coat, greyish and semi-transparent at the segmental divisions, the head pale greyish-brown and glossy, the black ocelli very distinct, the lobes on the crown blackish-brown, a pale greyish-ochreous faint dorsal line having beyond the fourth a distinct roundish paler ochreous spot near the end of each segment as far as the twelfth segment, whereon they end ; a fainter subdorsal fine line of greyish-ochreous, but much interrupted, so as to be visible chiefly towards the end of each segment ; the dark colouring of the back extends to the spiracular region, which is edged with black ; this is followed by a subspiracular stripe of drab colour, and the belly is a much darker drab ; the tubercular dots are black, each with a fine hair. On September 29th one again moulted ; the details are as above with the exception of the ground colour, which is now deep crimson-brown and velvety ; it is just a quarter of an inch in length. On the 21st I found one had died, my number thus being reduced to four, the most advanced of which has just moulted, and is at present of a light chestnut colour. On the 11th of December it was five-eighths of an inch long and stout in proportion, and had for a fortnight been eating decaying and dead leaves of birch and a little grass, the other three generally hybernating, sitting up on the leaves in the form of S. The largest at this time was

deep reddish or crimson-brown above as far as the spiracles, below these and on the belly a lighter tint of the same. The back is freckled with darker brown, and with paler. The dorsal line is a double line of dark brown, best seen at the beginning of a segment, becoming fainter afterwards, enclosing a thread of the ground colour which towards the middle of each segment shows pale whitish-cream colour for a short distance, and after a short interval appears (on the first segmental subdivision) as a roundish wider spot of pale whitish-cream colour (quite isolated). This spot varies a little in its form on each segment, inclining a little towards ovate, or else squarish, less distinct on the twelfth segment, and smaller on the thoracic ones. The subdorsal line is similarly composed of two rather interrupted dark brown lines containing two or three pale cream-coloured small spots or freckles; the most distinct is opposite the largest dorsal spot; just beneath this on the side is a blackish-brown blotch; the spiracles are of the ground colour margined with black. Below the spiracles is a ragged freckly rather interrupted line of flesh colour and another a little below as though they were the pale edgings of a subspiracular stripe; the belly is also freckled with flesh colour; the front legs are light-brown, the others freckled with flesh colour, especially the front of the anal pair. The tubercular dots are blackish but not well visible, excepting on the two last segments. The head is brown with blackish-brown on the crown of each lobe. (W. B., 1874, Note Book II, 99, 100, 104.)

On the 17th of June, 1880, I purchased three full-grown larvæ from Mr. T. W. Salvage, then at Innerhadden, Kinloch-Rannoch, Perthshire, feeding on birch and heather. The larva of the darkest variety was one and one-eighth of an inch or a trifle more in length when stretched out in walking, plump and cylindrical, much rounded behind, tapering at the anal segment and from the second to the head, which was the

smallest. The ground colour was reddish or red-brown, slightly mottled with grey; the dorsal marking was almost linear, widening a little slightly but narrowly lozenge fashion near the end of each segment and having on this widest part a round pale spot of dirty ochreous, the sides much mottled with grey atoms, strongly along the spiracular region. The belly and subspiracular stripe of a paler dirty pinkish-brown ochreous, the latter rather palest; the tubercular dots most minute and black; spiracles black; the head shining brownish-ochreous with two black dots in front of each lobe; ocelli black; the body soft and velvety; a slight indication of the usual *Noctua*-like transverse marking is faintly visible on the twelfth segment and more faintly still on some others; a round pale spot on the side is beneath each hind dot of the trapezoidals, though less noticeable than that on the dorsal marking. Another variety, figured on the 19th, is of deep brownish-ochreous pink freckled and mottled with grey and pale flesh colour. These three larvæ matured rapidly and then entered the peaty soil. (W. B., 1880, Note Book IV, 12.)

PACHNOBIA ALPINA.

Plate LXXX, fig. 2.

On the 27th of July, 1878, I received eighty-five good eggs and one infertile of this species, laid within two glass-bottomed boxes, one of which contained ten eggs and the other the remainder, from Mr. E. G. Meek. When first laid the eggs were pale yellow and, with only a single exception loose, were all adhering to the paper lining chiefly, just a few being on the glass. When they reached me they had changed colour to a dirty whitish or pale straw ground-colour, having a central blotch at the top of blackish-brown and a little below a broad irregular zone, *very ragged-edged*, of deep

purplish-pink. A few became all over purplish-brown the same evening. The egg is very strongly and boldly marked with this dark colouring, the paler ground whitish-straw. Twenty hours before hatching it assumes one uniform purplish-grey tint like the bloom on grapes, but glistening. The eggs were laid in little scattered groups and singly. The shape of the egg is circular, rounded above, rather flattened beneath, rather boldly ribbed and reticulated, and slightly glistening, becoming paler just before hatching. On the 1st of August one egg hatched, and on the 2nd half the number were hatched by early morning, two more late in the evening, and on the 3rd all but four or five were hatched by early morning, and of the remainder one at noon.

When just hatched the young larva is of a smoky olive-grey colour with dark shining brown head and plate on second segment, and with minute blackish dots on the body. Given bilberry for food at first they soon riddled the leaves with small holes. First moult? By the 12th they had become of a dingy brownish olive-green with minute blackish tubercular dots, blackish-brown heads and small plates on second segment. Some were olive-green, skin rather shining. August 15th, a few had moulted (I think for the second time) and the rest were preparing to moult. Now after this moult the colour is velvety-brown with faintly paler dorsal and subdorsal lines which pass through the second segment like the others, the little darker plate having almost disappeared and become velvety; the belly paler and rather greyish-ochreous; the dots black. They seem not to care for heather. They not only skeletonize the bilberry leaves, but eat rather large holes through them. On the 26th of August I removed them from the test bottles, all in good health, for only four individuals had died since they were hatched. October 28th, the last two larvæ are dead; after the bilberry plants had shed their leaves, birch, saw, and heather were supplied as

food, but though they fed a little, yet they began to die off by threes and fours until all were dead. Their natural food, *Empetrum nigrum*, I was unable to get. This larva feeds up in May and June, and is in pupa only a month. (W. B., 1878, Note Book III, 246).

On June 17th, 1880, arrived two larvæ of this species, which I bought of Mr. T. W. Salvage, then at Innerhadden, Kinloch-Rannoch, Perthshire, said to be feeding on *Empetrum nigrum*, the Crowberry. They were little more than one inch long, and I found them eat whortleberry (*Vaccinium myrtillus*), though sparingly. On the 19th, I saw one, the largest of the two, was soon about to moult; this was a much lighter variety and rather handsome. The other, a dark variety, I figured on the 21st.

It is of the usual *Noctua* form, cylindrical, tapering at the second segment to the head, and also at the 13th segment. In colour it is dark velvety purplish-brown above and pinkish-drab below; the head is brown and glossy, having a corona of darker brown freckles beginning on the crown, which are broadly continued down the side at the back of each lobe in a curve till they approach the ocelli; on the second segment is a narrow crescentic velvety black-brown plate, very finely dorsally and subdorsally divided with the ground colour; subdorsal fine pale drab lines rather interrupted at the end of each segment, or, showing but faintly and near the beginning of a segment, are bordered above with a black dash, most conspicuous on segments eight, nine, ten, eleven and twelve; the paler ventral colouring commences along the spiracular region, distinctly but not abruptly marked in any way; the spiracles are black; a black-brown velvety plate is on the anal flap; the dorsal pattern is a top shape, pointing backward, of dark purplish-brown, and a central or dorsal spot of black at the beginning of each segment; skin rather rugose. On the 23rd, after moulting in the morning at ten o'clock, the largest larva, which had been laid up for this event four days

previously, had now become much darker, and the head and plate remained so pale a flesh colour as to be almost whitish, in singular contrast with the body, but in a few hours regained its former brown colour, but the larva skin is more rugose, neither velvety nor shining. On the 28th, I figured another larva in its penultimate coat of a deep brownish-pink, the dorsal and subdorsal thread-like lines of dirty whitish with a row of black dashes above on the latter, and blackish edging to the former just at the beginning and ending of a segment.

It is to be recorded that the larva, besides bilberry, will eat birch a little withered, also arbutus, especially the younger leaves, indeed the older leaves too, and as freely as though it were its natural food.

The penultimate skin of *Pachnobia alpina* is rather handsome, and proves by its pattern of markings to belong to the genus *Noctua*, and should be in its proper place at the end of that genus.

After the last moult its skin is seen to be pachydermatous, for to compare small things with great, its skin is like that of an elephant, leathery and rough with wrinkles, the pattern being composed of black freckles upon a deep rosy brownish-red ground; on the belly a few paler or flesh-coloured freckles appear on the reddish ground, without any black ones. One larva (subj. 3.) moulted the last time on June 21st, and in a day or two the change from its former gaily-coloured coat to the more sombre full dress was very remarkable. The behaviour of this individual was very wilful and intractable; when put under a glass it roved round and round eager to escape, but after a while finding it impossible, it coiled itself partly round and went to sleep for many hours, and when in this condition was not easily waked. Indeed the natural habit of this and three other examples is to sleep all the day through and to feed only at night, and even then rather sparingly, as proved by there being

only two, or at most three, pellets of frass to be found with each larva each morning.

The dorsal marks are diamond shapes of blackish minute freckles.

Subj. fig. 1, which has with me been feeding sparingly since the 17th of June, is now (July 9th) laid up in preparation for a moult, and in the afternoon of the 12th it was accomplished; it grew afterwards a little and became like subj. 3 in colour and roughness, but was not so large, and it ceased to feed and went to earth on July 27th.

Subj. fig. 2 died on July 20th.

Subj. fig. 3 grew to be one and a half inch long and stout in proportion, and uniformly so throughout, the head being but a trifle smaller than the second segment, and the thirteenth a little tapered behind; this individual about the middle of July was decreasing in bulk and length, and though put then with earth it seemed too late for it to go under or make up as I expected, and it remained on the surface and died gradually.

Subj. 4 kept feeding chiefly on arbutus and was but little grown by the 7th of August. (W. B., 1880, Note Book IV, 21).

Thirty eggs of *P. alpina* sent by Mr. Meek from Shetland arrived 9th July, 1880. They were precisely similar to those of 1878, recorded in Note Book III, p. 246. On the 13th of July they turned all over a dingy brownish-slate colour, the coarse ribs very glistening, and next day became a pale grey colour. One larva was hatched on the evening of the 14th, and eleven more by next morning.

The young larvæ, in the course of a few hours, took to birch and more sparingly to arbutus, and the next day quite freely to whortleberry, and did well until I left home for six days, when on my return on July 30th, I found all were dead but two; another died on August 4th, and the last on the 5th. (W. B., 1880, Note Book IV, 23.)

TÆNIOCAMPA GOTHICINA.

[Plate LXXX, fig. 3, *T. gothica*.*]

A batch of eggs sent by Mr. John Dunsmore, of Paisley, on June 6th, were all hatched in coming to me on the 7th. Only one empty egg-shell remained uneaten. This was round and domed at the top, flattened beneath, finely ribbed and reticulated, white in colour, with a large hole in the side where the larva made its exit.

The young larva is of a slaty-green colour, head, narrow plate behind it, and fine tubercular dots black. By the 14th they were nearly a quarter of an inch long, with pale yellowish-green head, darker bluish-green body, having bluish-white dorsal and subdorsal lines, and a greenish-white subspiracular stripe, head and pale yellow-green plate dotted with black, a line of paler freckles on each side of the back just above the subdorsal region, and tubercular dots black. By the 23rd they had grown considerably, the most advanced by this date being seven-eighths of an inch in length, their colouring much the same as before. By July 1st the most forward measured about an inch and a half in length; ground colour of some bluish-green, of others yellowish-green, yellowish at segmental folds, yellowish or yellowish-white freckles on the back, much fainter, hardly noticeable, on the belly; dorsal line yellow, also the subdorsal, but thinner and a trifle broken; the inflated spiracular stripe is irregularly bordered on the side above with blackish more or less; the upper edge of the stripe itself is pale yellow, sharply defined against the black above it, and the lower edge is gently defined with a thin faint line of yellowish, the oval spiracles white, outlined with black.

NOTE.—In *T. gothica* the inflated spiracular stripe

* The larva described as *T. gothicina* was not figured. It is now generally acknowledged that *gothicina* is only a variety of *gothica*.—B. McL.

is often wholly white. None of the black dots remain on the body, a yellow freckle larger than the others is substituted for each of them, excepting on the green shining head, where they are just discernible with a good lens; the ends of the jaws black; the skin of the body soft and velvety. (W. B., Note Book III, 82.)

TÆNIOCAMPA LEUCOGRAPHIA.

Plate LXXX, fig. 4.

On the 28th April, 1871, I received a batch of eggs from Mr. Evan John, of Llantrisant, Glamorganshire. The eggs were laid on muslin and paper.

The egg is globular, finely ribbed and reticulated, and, when first laid, of a pale straw-yellow, soon turning to pale flesh colour with a splash of brown on the top, and a ragged-looking irregular zone of brown round the middle. In a few days they began to grow of a pinkish-brown by degrees, the splash at top and the zone being merged into the same general colour. (W. B., 1871, Note Book I, 76.)

TÆNIOCAMPA OPIMA.

Plate LXXXI, fig. 2.

A batch of eggs laid in a cluster on a stem of marram-grass was sent by Mr. G. T. Porritt on the 17th April, 1872. Mr. Porritt stated that the moths of this species deposited their eggs also on the old withered remains of ragwort and houndstongue.

The eggs at first are pale yellow and conspicuous on the dried-up remains of the plants even at a considerable distance, but gradually change to a purplish-brown, and so become inconspicuous. On the 23rd they began to grow of a leaden hue, and on the 24th were covered with a pale bluish tint like the bloom of ripe sloes, and in the afternoon they began to hatch.

The young larvæ were at first of a bluish-green,

with black heads, becoming gradually by the fifth day of a more dirty pale olive-greenish tint with blackish-brown head and small plate behind it. By the 5th of May they had moulted, their dark heads were gone, and they had become of a very pale coloured watery-greenish tint.

Their food was *osier*, which they seemed to prefer to *Rosa spinosissima* or *sallow*, both of which were at first given them on account of their coast sand-hill origin. On the 7th May they had spun a quantity of fine web amongst the *osier* leaves. On the 9th of May the next moult gave them a dark blackish-grey or greenish coat with the lines greyish or whitish-grey, the tubercular black dots ringed with the same; head and plate pale brownish-green, spotted with darker brown. On May 15th the body was grass-green, with lines of pale grey; head and second segment dotted with black. By the 25th May they had become nearly three-quarters of an inch long, of rather a deep dull green on the back and sides, very finely freckled with blackish; the subspiracular stripe paler yellowish-green, bordered above by a stripe of thickly freckled or of blackish atoms; the dorsal line a little paler than the ground colour, and the subdorsal can also be faintly traced; the head pale brownish-green.

These all throve well up to the 5th of June, but then began to sicken and die off, all being dead by the 20th. (W. B., 1872, Note Book I, 166).

Eggs from Miss Johnson, of Liverpool. Eggs turned blackish, laid in a heap together on the tops of small stems. They hatched April 24th and 25th, 1880.

The young larvæ were dingy slaty-green, with black head and plate; growing gradually paler and paler.

First moult May 1st; larvæ very pale greenish, head green; a small black plate on the second segment.

Second moult May 6th; larvæ dingy dull bluish-green, with paler dorsal, subdorsal, and spiracular

lines; head and plate warmer shining green, both dotted with black; the minute tubercular dots black.

Third moult, May 14th; larvæ darker dingy bluish-green; head and plate lighter green, glossy, and dotted with black; the dorsal and subdorsal lines and spiracular stripe rather whitish; above this last runs a stripe of darker blackish-green, and above that a faint whitish edging or a rather broken line; tubercular dots whitish with black centres.

Fourth moult, May 17th, 18th, 19th and 20th; larvæ at first half to five-eighths of an inch long, but uniformly stouter in proportion; the lines of pale greenish ground colour, the spaces between them thickly freckled with dingy blackish-green; the dark stripe on the side quite blackish above the broad pale spiracular stripe; head shining yellowish-green dotted with black; plate of same colour, but velvety, and with few black dots; tubercular dots scarcely to be distinguished from the freckling.

Fifth moult, May 23rd, and onward to 27th; the larvæ now much as before, but the spiracular stripe is pale yellower green, almost yellow; the black stripe next above is very strong, so close together are the freckles of which it is composed; the head and collar-plate rather olive-green, the same on the anal flap; the lines of the body yellow-green, also the tubercular dots in threes; the ground of the back thickly covered with minute black freckles; the black dots on the head very small, and almost obliterated on the collar-plate.

Sixth moult, May 27th, with one or two others on the 28th, 29th and 30th; larvæ now immediately after moulting one and one-eighth inches in length; back and sides blackish olive-green, thickly freckled with blackish, and sprinkled with some pale yellowish; the belly pale greenish-yellow, the spiracular stripe still yellower, and very much paler, almost white next the black-atomed stripe above; head and plate light olive, the former reticulated with brown and

shining, the latter dull with front margin darker, the dorsal and subdorsal lines very thin, and paler than the ground, tubercular dots paler, still in threes, but so small as not to be noticeable without a lens; spiracles oval, white, finely outlined with black. The colouring by degrees in a day or two on the back and sides turns of a rich velvety brown, and, just at last, of a crimson-brown, in strong contrast to the brilliant greenish-yellow of the belly and lighter yellow spiracular stripe.

They have been from the very first most voracious feeders in proportion to their size, consuming great quantities of sawfly. They began to enter the earth, a few on June 4th, 5th, 6th and 8th, and at intervals up to the 18th. The moths appeared from the 11th of March to the 27th of April, 1881. (W. B., 1881, Note Book IV, 10.)

TÆNIOCAMPA GRACILIS.

Plate LXXXI, fig. 5.

Variety of the larva of Tæniocampa gracilis.—To those who know the larva of this species only in its more usual bluish-green, or yellowish olive-green coat, the following description, given me by Mr. Buckler, of a variety sent him from Epping, will seem strange; but there can be no doubt as to the moth which was bred from it.

The ground colour of the larva was *deep brown* tinged with pink, the slender dorsal and subdorsal lines of the same, but showing rather paler; along the region of the spiracles, and reaching half-way down the anal pro-legs, a broad stripe of pale dingy pink, sharply edged above with a fine blackish line; belly and legs of the ground colour; the usual dots appeared dark brown within paler rings, and the back was slightly freckled with the paler tint. (J. H., February 23, 1865, E.M.M., I, 283, May, 1865.)

TÆNIOCAMPA CRUDA.

Plate LXXXII, fig. 2.

On the 2nd of April, 1871, I received from Mr. F. E. Harman, of Whitfield, near Hereford, a few eggs (or rather larvæ, as they had hatched on the way) of this insect. When just emerged the caterpillar is dirty greenish, with a rather large, shining black head. Until a length of about half an inch has been attained, it lives in a sort of retreat formed by drawing together, by means of silken threads, several leaves; and afterwards it still forms a similar retreat in which to moult.

The adult larva is about one and a quarter inch in length, and of moderate bulk in proportion. Head globular, about the same width as, or perhaps very slightly broader than, the second segment; body cylindrical, and of uniform thickness throughout; skin smooth and soft, semi-translucent, and rather glossy. The ground colour is dark smoky-green, variegated with yellowish-green, in some specimens the yellowish-green predominating; both the ground and markings vary in intensity in different specimens. Head smooth and shining, grey, very thickly marked and dotted with intense black; there is a black shining plate-like mark on the second, and another on the anal segment; that on the second is divided by the medio-dorsal and subdorsal lines. The medio-dorsal stripe is yellowish-white; the subdorsal lines narrower, white; two parallel waved lines of the same colour as the medio-dorsal stripe form the spiracular lines; these waved lines form a sort of chain-like band of oblong spaces, and in the centre of each space, just below the upper line, the black spiracles are situated; the trapezoidal dots also black. Ventral surface and pro-legs uniformly dull yellowish green; the legs black.

Rests on a leaf, with the head bent considerably round to one side. My larvæ fed on whitethorn; and

were full-grown and went down May 28th. (G. T. Porritt, 8th June, 1872; Ent., VI, 138, July, 1872.)

OETHOSIA SUSPECTA.

Plate LXXXII, fig. 3.

In 1891, *Orthosia suspecta* seemed to be unusually abundant in all its localities, and was especially so at York, where throughout August it occurred in the utmost profusion. Mr. William Hewett, of that city, obtained eggs from specimens he captured there, part of which he very kindly sent to me, and part to Dr. Chapman, of Hereford. Mine, which I received on September 20th, were deposited in a batch at the bottom of a chip box, and were of ordinary globular form, very glossy and smooth, the colour pale pinkish-brown. They were kept outdoors all winter, and at quite the end of April began to hatch out. Unfortunately, I had to be in London at the time, and through my inability to properly attend to them there, all died. Fortunately, Dr. Chapman was more successful with his, and on May 18th, he very kindly let me have two larvæ, which were then nearly full-grown, and I described them at once as follows:

Length, when at rest about three-quarters, when crawling seven-eighths of an inch, and moderately plump in proportion; head small and polished, the lobes rounded; it is rather narrower than the second, and considerably narrower than the third, segment; body rounded, slightly swollen from the segmental divisions; it gradually thickens from the head to the fifth segment, beyond which it is of nearly uniform width to the twelfth, when it tapers off rather abruptly; segmental divisions well defined, the skin smooth and velvety.

Ground colour, as far as the spiracular region, purplish-brown; head yellow-brown, strongly marked

with black, a streak of black extending from the top of each lobe being most noticeable; a narrow, polished black plate on the second segment; dorsal line almost clear white, and on the dark ground is very conspicuous; subdorsal lines very indistinct—except in the plate on the second segment, where they show clearly—and seem to be composed of an interrupted series of faint bluish-white streaks and dots; on each segment between the dorsal and subdorsal lines is a large square purplish-black mark, and these marks, together with the pale dorsal line, form the most noticeable feature in the larva. There are no perceptible spiracular lines, but the spiracles are black and very distinct. The usual trapezoidal dots small and indistinct, of the pale colour of the subdorsal lines.

Ventral area and pro-legs uniformly dingy glaucous-green, with a purplish tinge; the anterior legs pale straw-colour, and having immediately in front, and also immediately behind each of them, a short black streak.

The larvæ fed up well on birch, and on or about May 23rd, both disappeared below the surface of the earth for pupation.

The moths, perfect specimens, emerged together on June 16, a month earlier than the species is usually seen in a wild state in Yorkshire. (G. T. Porritt, 7th January, 1893, E.M.M., XXIX, 41, February, 1893.)

As Mr. Porritt did not see the young larva of *O. suspecta*, I add a few notes of my own observations:

The eggs were packed closely together side by side, and appeared to have been thrust in between two surfaces, and it resulted both from this (if so) and also from a real identity, that they reminded me greatly of those of *Cerastis vaccinii*. A closer examination only confirmed this impression; the diameter was 0·8 mm., most of the eggs were more or less distorted, indented, or flattened, so that it was only by securing a favour-

able specimen that it was seen to have a fine cone, surrounded by an irregular raised wall, formed by the summits of the ribs, about thirty-one in number, and badly defined. The eggs were in places covered by a pavement of battledore moth scales, whether purposely, or by accident I could not be sure.

I got some *C. vaccinii* eggs to compare, and could really detect no difference. The young larvæ of both were much alike, but *O. suspecta* tied its leaves together more or less, a habit which I have never noticed in *C. vaccinii*, the larva being satisfied with such shelter as curled or applied leaves afford.

When in their *penultimate* skins, they were of almost the same outline, *O. suspecta* much darker in colouring. In tubercles, head hairs, plates on second and fourteenth segments, and especially in the forms of the marblings, from which the markings of *Orthosia* larvæ result, they are identical; both also taper remarkably to the head; a feature which is even more pronounced in adult *O. suspecta*, but is nearly lost in adult *C. vaccinii*. The most evident difference (apart from the darker colouring of *O. suspecta*) is that in *O. suspecta* the pale dorsal line is very marked and distinct, and the subtrapezoidal line is broken into by the marblings, so as to be discontinuous, though recognisable as a line. In *C. vaccinii* the subtrapezoidal is more pronounced than the dorsal line, it is ragged, but broad enough not to be quite interrupted by the marblings. The dorsal line in *C. vaccinii* is narrow, and differs little from the ground colour, though it is as smooth and well defined as in *O. suspecta*.

In accordance with the darker colour of *O. suspecta*, the pale dots around the tubercles are smaller, and hardly form a feature in the general facies of the larva, and in the case of the anterior trapezoidals, they do not extend in front of the tubercles. Similarly, the plate on second segment has its dark areas both darker and rather larger in *O. suspecta*.

The lateral line separating the darker dorsal from

the paler ventral portion of the larva has the same disposition in both. It takes in the pale area round the anterior spiracular tubercle, from which a pale line goes beneath the spiracle, thus claiming the spiracle for the line or dorsal area. On the eleventh and twelfth segments the spiracles are plainly in the dorsal area in both species. In *O. suspecta* the inner margin of the subtrapezoidal line on the dorsal plate of segment two is curved inwards; in *C. vaccinii* nearly straight. All this takes long description, but as a matter of fact, the actual differences are trifling; so that up to this point *O. suspecta* and *C. vaccinii* present only trifling specific differences.

In the last skin *O. suspecta* retains the small head, and becomes so richly coloured as to remind one of *Tæniocampa rubricosa*.

The pupa is very like that of *C. vaccinii*, but more slender and tapering. The anal armature is also similar. In *O. suspecta* the wrinkled boss is larger and longer, and so the secondary spines which cross the two principal lyre-shaped spines in *C. vaccinii*, arise further from the apex, and do not do more than fully reach them.

In larvæ and pupæ the species of *Xanthia* and *Orthosia* differ from each other, often in small matters only, and *Cerastis* is not far off, but *O. suspecta* much more resembles *Cerastis* than it does *Xanthia* or *Orthosia*, at least as pupa, and as egg and young larva. (T. A. Chapman, January, 1893, E.M.M., XXIX, 42, February, 1893.)

ANCHOCELIS RUFINA.

Plate LXXXIII, fig. 1.

On October 27th, 1882, Messrs. J. and W. Davis sent me three dozen eggs of this species laid on a piece of oak twig, side by side in rows and scattered groups

on the bark, to which they closely assimilated in colour.

The egg is of a circular shape, flattened beneath and rounded above, and numerous ribbed and rather glistening; in colour pinkish-brown above with a paler blotch on one side of the circumference; a zone follows of rather deeper pinkish-brown; and the base is a pale drab tint. On the 4th of April, 1883, some of the eggs changed to dark drab and others to a lighter colour of a pale drab all over; and by the evening of the 5th six hatched, two in the morning of the 6th, three on the 8th, four on the 9th, one in the evening, two on the 10th, one on the 11th, and one on the 12th.

The young larvæ, which were fed with elm buds just bursting, appeared strong and vigorous, and looped in walking. Their colour was a tender drab-grey, or pinkish-grey, with deeper grey-brown dorsal vessel showing through the skin as far as the tenth segment; the head lightish brown and glossy; tubercles indistinct, but the hairs from them very perceptible; the last three segments dirty whitish, but in a few hours after feeding these became, like the rest of the body, a pale drab; a light or whity-brown plate is on the second segment, well divided in the middle by two dusky lines and similarly edged at the sides; the tubercles dusky and the hairs also; in three days' time their bodies were of a uniform drab tint and showed the details of dusky dots and hairs distinctly. On the 14th of April they had become green with shining skin, having a whitish dorsal stripe, whitish subdorsal and lateral lines, and a broad whitish spiracular stripe; when walking they loop, using three pairs of ventral legs, holding on with them and the anal pair, with the first ventral pair shorter and held free when at rest in the letter S-like posture; on the 17th, all the lines were, when seen through a lens, beautifully distinct; only a brown outline discernible of the front plate, as the second segment is marked

like the others. On the 21st, some were laid up, and others had got over their moult; the white stripes and lines are still more distinct than before, and the green ground is more bluish-green; and a fine black line forms the edge in strong contrast to the very broad white spiracular stripe. On the 2nd of May, one had now moulted again (probably for the third time); it was noticeable now that the subdorsal and lateral lines are much faded and only just discernible; the dorsal stripe is still whitish, and the broad spiracular stripe is as brilliantly white as ever; noticeable now too is the fact of the tubercular dots being changed from dark to light, as they are now rather whitish and larger in proportion. This stage was reached by most on the 9th of May, though some were laid up in preparation; the rich deep green colouring is now very bright. May 12th, the most advanced have now changed from green to brown, though many are still green but dingier. On the 18th, when I figured one, the dorsal line is very dirty whitish; the spiracular stripe remains pure white; the other lines, though suffused with the ground colour, can yet be traced, though only by the dark freckly edging; the tubercular dots are whitish and in threes on each side of the back; the first of each three is the smallest; the spiracles are black and at the upper edge of the white stripe; its stoutness is now much increased and the length is nine lines. On the 24th they had again moulted, and on the 25th they measured one inch in length and most were of a brownish-green, others being brown, the details as before; the spiracular stripe still white; the paler spots still distinct; during three days, although they had plenty of fresh food, yet they betrayed a propensity to cannibalism, as three that were laid up to moult were devoured, a part of one only remaining to account for the diminished number. On the 27th, several were found dead and flaccid, which caused me to change their food from elm to oak. Now, excepting just on the thoracic segments, the dorsal stripe

and the subdorsal and lateral lines are almost entirely suffused with the ground colouring, the spots paler and distinct, the spiracular stripe still conspicuously white. By the 1st of June they were full-grown and measured when stretched out one and a half to one and five-eighths of an inch, the thoracic segments tapering to the head, which is the smallest; the rest of the body cylindrical; segments plump; the colour is rather olivaceous-brown, thickly freckled with darker so as to obliterate all lines, there being but slight paler indications of dorsal and subdorsal ones on the second, and all the spots slightly paler, defined with darker than the ground, in threes along the back; the belly rather lighter but similar to the back; the spiracles black, at the upper edge of a pure white stripe, which is attenuated towards the head and on the last segment; a dark brown streak on each lobe of the head, which is finely reticulated. (W. B., 1882, Note Book IV, 179.)

ANCHOCELIS LUNOSA.

Plate LXXXIII, fig. 3.

I should not offer a description of this larva were it not that I think it scarcely comes under the generic characters given of the *Anchocelis* larvæ in the 'Manual,' whilst some of its distinguishing characters are omitted in the specific description after Guenée.

In October, 1865, Mr. H. Terry sent us some eggs, the larvæ from which I found feeding by the 28th of that month. They were then of a dull blue-green, with black heads, and rested on blades of grass, with their heads turned round sideways. On February 22nd, 1866, I noted that they were of various lengths, from one-third to half an inch, and the smaller ones were still green, whilst most of the bigger ones (being a moult in advance) had a brownish tinge; and all had

a pale dorsal line and a pale ochreous collar behind the head.

In April they attained their full growth, when I took the following description: Length, one and a quarter inches; stoutish, cylindrical, tapering slightly towards the extremities; head round; dorsal plate on segments two and thirteen; the warts large, conspicuous, raised, and emitting bristles; skin (not velvety, but) shining. Ground colour usually an olive-brown, darker all over the back as low as the subdorsal line; dorsal and subdorsal lines fine, ochreous; side below the subdorsal line paler than the back, but deepening towards the spiracles, which are placed in a dark line; below the spiracles the colour is a dull purplish-brown; head pale brown; the plate on second segment pale yellow (very conspicuous) edged behind with black.

There were varieties which retained a great deal of their juvenile greenness to the last, the side between the subdorsal line and the spiracles being more green than brown, and the belly pale greenish; and there was one larva which remained quite green all over, the back being deepest in tint, just as in the brown variety; the warts in this larva were not so conspicuous, but in every case the pale yellow of the second segment is very striking. (J. H., Jan. 28, 1867; E.M.M., III, 260, April, 1867.)

ANCHOCELIS LITURA.

Plate LXXXIII, fig. 4.

I owe my acquaintance with this as well as several other species, to the great kindness of Mr. George Norman, of Forres, who sent me a batch of eggs on October 2nd, 1869; they were mostly laid thickly together in a flattish mass on a piece of paper, though there were some few loose and separate from each other; they began to hatch with Mr. Hellins at Exeter

on the 5th of April, 1870; by the 22nd, the larvæ were three-eighths of an inch long; by May 15th they had attained twice that length, and about the end of the month they, like mine, all went to earth; the moths appeared September 2nd to 11th. With me, however, the eggs did not hatch before the 11th of April, 1870.

The shape of the egg is circular, but flattened, and greatly depressed in the centre, slightly ribbed and reticulated, having withal a shrivelled, empty appearance, as though its contents had been squeezed or dried out of it; the colour at first is pale yellow, soon after turning to a slightly pinkish leaden hue, and the shell is very glistening—in fact, the flat mass of eggs seemed smeared over with a coating of transparent varnish or gum, which I fancy would in nature attach them to some cover on the upper as well as the lower surface; I think they would be laid in cracks, or under loose bits of bark; as the time of hatching approached the colour seemed but very little heightened, and when the young larvæ had emerged from them, the empty shells looked brilliantly crystalline.

The newly-hatched larvæ were pinkish-grey in colour, with the dorsal vessel appearing as a dark grey, leaden stripe, the pale brown head large in proportion; within a fortnight they became of a dull flesh colour; after the second moult they were pale greyish-green, and soon turned darker, then showing the usual lines pale and distinct, their length being now three-eighths of an inch, and their figure proportionately stout; by the 6th of May they were five-eighths of an inch long, of a yellowish-green colour, the lines rather paler green, the tubercular dots exceedingly small and blackish; by the 15th they were three-quarters of an inch long, of a pale yellow-green, the lines all present but unobtrusive; up to this time they had fed almost entirely on the common garden monthly rose, which they preferred from the first to all other food given them in great variety from

time to time; but at this period they were tried with bramble, and after tasting it, they no longer cared for rose, and thenceforward fed up chiefly on brambles of different species.

The full-grown larva was one inch and a half in length, moderately stout, cylindrical, and uniform in bulk, with tolerably well-defined segmental divisions; the colour on the back and sides, as far as the spiracles, green, somewhat inclining to olive, and freckled with a little darker green, and on this freckled surface the dorsal and subdorsal lines could be distinctly traced, a little paler than the ground, but edged with interrupted, freckly, almost blackish, lines, which, in some instances, especially with the dorsal line, seemed almost to obscure the pale line they enclosed; the tubercular dots were also paler than the ground, and very finely ringed with darker green; the boundary of this green colouring along the side was completed by a black line, interrupted only where the spiracles (white, outlined with black) were placed upon it; immediately beneath the spiracles the contrast of whitish-yellow deepened a little by degrees into a pale yellowish-green; which was the colour of the belly and legs; these last were tipped with brownish; the head was brownish-green, freckled with darker; the second segment was not very different in texture from the rest of the body; it was in most examples edged in front with very dark brown, and the pale lines that appeared on it were without any dark edging; the whole brood presented scarcely the least variety, either in colouring or detail, but were as constant as possible in their uniformity.

Some of the larvæ, which were kept in a flower-pot with sand for soil, formed very neat compact cocoons of silk, covered thinly but uniformly with the sand, rather more than five-eighths of an inch long, and about five-sixteenths broad; probably, in a coarser soil, they would have been less regular in outline.

The pupa was rather short and stout, smooth and

cylindrical, ending in a short pair of blunt spikes, diverging from each other; the colour a deep reddish-brown. (W. B., June, 1872; E.M.M., IX, 39, July, 1872.)

DASYCAMPA RUBIGINEA.

Plate LXXXIV, fig. 2.

On March 21st, 1868, Mr. Thomas Terry, of Babbicombe, took a female at fallows, and shut her up in a glass-topped box about six inches square, putting in for her food a little plum-jam. On March 28th he saw two eggs had been laid on the box; on the 30th, three more; on April 1st, two more on the box, and four on a sprig of blackthorn which he had supplied. These were followed by three or four more, for which I have no dates, and were all laid singly, on the underside of a leaf, or under any little projection in the box. How, after this again, the unhappy moth stuck in the jam, and perished miserably with eighty-seven eggs in her still unlaid; how, of the few secured, bad luck pursued nearly one-third, either before or just after the hatching of the larvæ, I will not relate at length; I mention these mishaps only to enhance Mr. Terry's liberality in still sparing eggs and larvæ to Mr. Buckler and myself.

The larvæ were hatched between April 19th and 23rd; fed freely on plum-leaves, and not so well on sloe, sometimes taking to knot-grass, and became full-fed from June 15th to 20th; and the moths appeared between September 8th and 20th.

The egg is unusually large for a *Noctua*, quite as large as that of *Xylocampa lithorhiza*; in shape round and full above, but rather flattened below; the surface is glistening, and ornamented with more than thirty slight longitudinal ribs, of which more than half terminate before reaching the apex; these ribs

are connected by very slight transverse reticulations. The colour at first is whitish, faintly tinged with yellow, but it soon becomes blotched with brownish-buff, in some specimens irregularly, in others more regularly with a central spot at the top, and a broad belt round the middle, and to the naked eye the egg now appears something the colour of a grain of wheat; after a time the blotches turn to puce, and finally the whole egg becomes pale purplish.

The larva at first is of a semi-translucent purplish tint, with brown shining head, and the usual dots black and distinct, each emitting a long wavy whitish hair. The first food eaten is the empty egg-shell, but after the larva has begun to eat leaves its colour soon becomes greenish. After a few days the colour changes to brown, and the hairs show golden in the sunshine; and after another moult the brown becomes darker, and the transverse rows of tubercular dots show to the naked eye like dark bands. When about three-quarters of an inch in length it assumes a waxy shining appearance, reminding one of an *Agrotis*, with the head and collar shining black, but after the next moult it comes out at first nearly black all over; this nigrity does not, however, last long; in a day or two the skin becomes paler, and from this time till it attains the length of one and one-eighth inches the description is as follows:—The ground colour ochreous-brown, with rather pale dorsal, subdorsal, and spiracular lines; the head dark brown; a dark brown dull plate on second segment, also on tip of the anal segment; the tubercular dots black and very distinct, the first dorsal pair of them in each segment after the fourth being placed in a blackish-brown transversely oval patch, which interrupts the dorsal line; the body thinly covered with very fine silky, brown hairs; in some specimens the oval dorsal patches are replaced by pairs of oblong dots, separated by the dorsal line. The length of the full-grown larva is one and a quarter inches when at rest, but more

than one and a half when in motion, its powers of self-extension or contraction being much greater than those of any other *Noctua* larva with which I am acquainted; the figure stoutest at the twelfth segment, and thence tapering regularly to the head, which is the smallest segment, and the thirteenth tapering rapidly behind, the anal pair of legs being remarkably close together; the skin is soft, and each segment swells out plump in the middle; all the tubercles and the plate on the thirteenth segment have disappeared, and amongst the long fine silky hairs there is now a growth of shorter ones. The colour is now purplish-brown, glistening in certain positions with a faint violet, mealy gloss; the pulsating dorsal vessel shows as an indistinct paler line; the dark patches down the back have become in some instances a thick, clumsy X on each segment, in others a pair of curved blotches, and there are also pairs of smaller and fainter dots on segments two, three, and four, those on four being the largest, and of a square form; the head is intensely black; the region of the back is curiously freckled with very fine blackish-brown curved marks, which, however, do not touch the X marks, but allow them, as it were, to stand out more distinctly; and in the same way the subdorsal and spiracular lines are to be distinguished by the absence of these freckles from the ground colour, rather than by any decided line of another tint; the spiracles small, black, and shining; the belly paler than the back, and somewhat tinged with green; the hairs are all of a beautiful golden brown. The habit of the larva seemed to be to hide itself by day, in spite of its silky, *Bombyx*-like clothing, and to feed and move at night; and I fancy its food, when at large, must consist of low plants, rather than trees or shrubs, otherwise we should hear of its capture.

The Zoological Record (vol. II, 1865) does indeed contain notices, extracted from Berl. Ent. Zeits., 1865, p. 112, and Stett. Ent. Zeits., 1865, p. 113, of

its being found in ants' nests, those of *Formica fuliginosa*; but its voluntary presence in such a situation is more than I can comprehend.

When about to change it spins a thin cocoon on the surface of the ground, working in moss or leaves above, and bits of earth, etc., below, but still keeping it of a tolerably oval form. The pupa is about three-quarters of an inch long, moderately stout, cylindrical, but a little depressed at the junction of the back of the thorax with the abdomen; from this point the abdomen rather swells out in size for about two-thirds of its length, and then tapers to a somewhat obtuse point, which is armed with a single tiny spike, and attached by two or three threads to the lining of the cocoon; the surface is shining; the colour dark purplish-brown. (J. H., November 26th, 1868; E.M.M., V, 206, January, 1869.)

XANTHIA CITRAGO.

Plate LXXXIV, fig. 4.

On the 9th of May, 1871, I received from Mr. John Firth, of Cleckheaton, a larva of this species; and on the 13th of May of the present year, half a dozen from Mr. John Harrison, of Barnsley. At this date they are about three-quarters of an inch in length, and have still to go through the last moult; for this purpose they enclose themselves in loose cocoons, forming by drawing together together two leaves with silken threads. At the end of May they are full-grown, and may be described as follows:—

Length about an inch, and tolerably plump in proportion. The head is very slightly narrower than the second segment, and still narrower than the third segment; it has the lobes globular, but the first rather flattened. Body cylindrical, tapering a very little towards the head; segmental divisions tolerably distinct, but not deeply cut; skin soft and smooth.

Ground colour of the dorsal surface dark olive-grey ; head smooth and shining, the upper part pale brown, the lower dark sienna-brown. Medio-dorsal line dirty white ; subdorsal lines similar in colour, but narrower and less distinct ; spiracular region dull whitish grey. On the second segment, just behind the head, is a semicircular black mark, divided by the medio-dorsal line ; above, and bordering the subdorsal lines, is a conspicuous series of longitudinal black marks, having the appearance of interrupted black stripes. Trapezoidal dots distinct, white. Spiracles enclosed in a black mark, very minute, greyish white. Ventral surface and pro-legs uniformly dirty green, the skin semi-translucent ; legs black and shining. Shortly before spinning up, the ground colour of the dorsal surface changes to yellowish brown. Feeds on lime. The cocoon is formed by drawing closely together several of the growing leaves, and the larva remains inside for two or three weeks before assuming the pupa state. The moths from my larvæ appeared at the end of July. (Geo. T. Porritt, November 11, 1872 ; Ent., VI, 257, December, 1872.)

XANTHIA CEBAGO.

Plate LXXXIV, fig. 5.

[Mr. Buckler published his descriptions of the larva of this species along with those of the larva of *X. flavago* (*silago*), under the title of 'Comparative Notes on the Larvæ of *Xanthia cerago* and *silago*,' as follows :]

Not until the season of 1869 have I had a good opportunity of really knowing the difference between these two species in the larval state, and for this reason : I never till then had both at the same time, but only one or two of either at long intervals, so that in my recollection they had somehow got to be so much alike as not to be known the one from the other.

No doubt this confusion had arisen in part from my having taken two or three figures at different times of solitary examples too far matured ; recent experience having demonstrated that when they are full-fed, or nearly approaching that condition, their distinctive characters have faded away, and their identification is then hopeless. I have therefore thought that a description of both *X. cerago* and *X. silago* may be of use to some who, perhaps, like myself, have hitherto been unable to distinguish the one larva from the other as they chanced to come under notice.

My sincere thanks are justly due for the kindness and liberality I experienced on the 29th of April from Dr. F. Buchanan White, of Perth, and on May the 4th from Mr. George Baker, of Derby, they having both sent me an abundant supply of sallow catkins containing young larvæ of both species ; and I may mention that thenceforth these larvæ all fed and thrive well on sallow leaves, and the moths appeared from the 30th of July to the 14th of August.

In both species the body of the larva is cylindrical, having the segments plump and deeply defined, and tapering a little anteriorly ; the head decidedly smaller than the second segment ; the hinder segment tapering also, and the anal pro-legs very close together beneath its extremity.

The larva of *X. cerago* has on the upper surface, as far as the black spiracles, a ground colour of reddish-brown or purplish-brown, and beneath the spiracles a much paler tint of the same ; the ventral surface pale greyish-violet with a slight tinge of bluish-green on the anterior segments ; the whole upper surface is freckled with dark brown excepting the segmental divisions, which, when stretched out, are seen to be unfreckled, and of rather a violet tinge.

The dorsal line, when visible, is pale brownish-ochreous, often obscured by the two dark brown lines that enclose it, and these often run together in a dark brown spot at the beginning of each segment, are lost

in the middle, and reappear at the end; for on the middle of each segment is a *diamond* shape of dark brown composed of thickly aggregated freckles; the subdorsal is a dark brown freckled line forming the upper boundary of a broad side-band of dark freckles, extending to the spiracles, which are situated on its lower edge; the subspiracular region, belly and legs, are faintly freckled with pale brown; the head is dark brown; the second segment has a black velvety collar or plate rounded behind, on which the subdorsal lines appear conspicuously whitish or pale ochreous, with sometimes a faint indication of a dorsal line on it; the anal tip is often similarly marked; the tubercular dots are often distinctly visible on the back in three pairs on each segment (two pairs being the usual allowance) scarcely paler than the ground colour, and ringed with dark brown.

When young, some larvæ of this species are much darker, with the marks and freckles almost black; but as they increase in size they become paler. In short, the distinct series of *diamond* shapes down the back and the broad dark band along the sides are characters that effectually distinguish this species.

The larva of *X. silago*, though of similar size, form, and general aspect of colouring, yet, when closely scrutinised, presents to view a different design in the ornamentation.

The freckling on the back extends on either side as far as the subdorsal region, forming on each segment an *irregular squarish* shape, quite uniform in depth of colouring, with the dorsal line only just indicated at the segmental divisions; the subdorsal region forms the upper boundary of a very *broad stripe* of *paler freckling*, followed by a much narrower and still *paler one*, and then a broad one of similar depth of colour to the back, but with more of a violet hue; the rest may be described in the same terms used for similar parts of the larva of *X. cerago*. (W.B., February, 1870; E.M.M., VI, 262, April, 1870.)

XANTHIA FLAVAGO.

Plate LXXXIV, fig. 6.

[See under *X. cerago* for Mr. Buckler's 'Comparative Notes on the Larvæ of *Xanthia cerago* and *silago*,' published in E.M.M., VI, 262, April, 1870.]

XANTHIA GILVAGO.

Plate LXXXV, fig. 1.

I feel greatly obliged to the Rev. J. Hellins, Mr. Albert Jones, and Mr. George Baker, of Derby, for their kindness in giving me this season the opportunity of figuring and describing the larva of this species, and also that of *X. ferruginea*; and especially to Mr. Baker for his caution that the latter species might be amongst the larvæ of the former, otherwise I might have kept them together and been defeated.

But the extra trouble of figuring and keeping each larva separate has been rewarded, as it has enabled me to point out the distinction between two very similar larvæ that may be easily mistaken for each other. The quotation from Guenée in the 'Manual' says of *X. gilvago*—"larva undescribed, because so common"; a passage I never fully comprehended until recently.

Both species of larvæ, obtained from seeds of wychelm, were sent me as *X. gilvago*, from 6th to 8th of June, within a few days or a week of their being full-fed, and the perfect insects appeared from August 24th to September 5th.

The larva of *X. gilvago*, when full-grown, is about one inch or an inch and one-eighth in length, rather thick and plump behind, tapering a little gradually towards the head, and a little just at the anal segment.

The ground colour above is greyish-brown, having a pinkish tinge, darkest on the thoracic segments; the lines similar, but of a paler tint; head reddish-brown; a blackish-brown plate rounded behind on the second segment, through which run the pale dorsal and subdorsal lines; these lines are, however, on the third and fourth segments, generally much suffused with ground colour, and not always, though sometimes, very distinct on the rest of the body.

The dorsal line is in some entire, and in others interrupted in the middle of each segment by suffusion of the dark purplish-brown marks it travels through, but it is generally distinct at the beginning of each segment, being there broadly edged with blackish. The purplish-brown mark of each segment on the back is in the centre somewhat of a diamond form, truncated behind, especially on the eleventh and twelfth segments, with the addition of a wedge shape on each anterior side united with it, their points close to the beginning of each segment, and their broad ends forming part of the diamond shape. The subdorsal line paler than the ground colour, often suffused at the end, but visible at the beginning of each segment, being there edged above by a short blackish-brown streak, which forms the point of the wedge portion of the dark mark of the back. The sides slightly mottled with purplish-brown, chiefly about the black spiracles, and close beneath them is a pale stripe of yellowish-grey, its upper edge still paler; the belly and legs of a similar tint, but a trifle darker. The four tubercular pale dots, ringed with dark brown, are situated within the dark marks on the back of each segment. This is a distinction by which it may be readily identified. (W. B., E.M.M., IV, 156, December, 1867.)

XANTHIA FERRUGINEA.

Plate LXXXV, fig. 2.

Though a trifle larger, yet in form and structure this larva closely resembles that of *X. gilvago*, but with the following exceptions :

The general colouring is of a browner tint, sometimes of an ochreous-brown.

The series of dark central marks on the back, with their dark wedges, assume together more compact forms of an urn shape, being attenuated behind, so that a constant character appears in the hinder pair of tubercular dots being outside the dark urn shapes. On referring to figures of this species of 1861 and 1865, the same characters are apparent, though two of them found under common ash varied much in colour, one being a grey variety, and the other a brighter and more distinctly marked example than any of those on wych-elm. (W. B., E.M.M., IV, 180, January, 1868.)

CIBRÆDIA XERAMPELINA.

Plate LXXXV, fig. 3.

In April, 1866, the Rev. Joseph Greene kindly sent me a larva he had found concealed in a chink of an ash-trunk ; but as the imago did not appear, its identity was not established till the present season.

On the 22nd of May, 1867, I had the pleasure to receive another similar larva, detected in a like situation near Leominster by Mr. Thomas Hutchinson, who also generously consigned it to me, enabling me to secure two figures of it in mature growth.

When full-fed, it spun a rather small cocoon, covered with grains of earth to which a few particles of moss adhered ; and the perfect insect came forth on the 5th of September.

The first larva was found before the ash trees had put forth blossoms, and ash buds were given it for food, into which the larva ate round holes, burrowed, and devoured the interiors.

The second and full-grown larva came after the ash had assumed its foliage, and it partook of young shoots for a few days before spinning. The larva had then attained nearly one inch and a quarter in length, and was rather broad in proportion, the head rather smaller than the next segment. Viewed sideways, it appeared tapering gradually towards the head, and from the eleventh segment to the anal extremity; but seen on the back, it looked of almost uniform width, excepting just at each end. The divisions deeply cut, giving each segment a plump appearance.

The larva, when two-thirds grown, is very suggestive of lichen, and of a lichen-feeder. Its head is shining dark grey-brown, mottled and streaked with darker blackish-brown; a black shining plate on the second segment having two rather broad angulated whitish stripes. The back and sides are brownish-grey, delicately mottled with a darker tint of the same.

The dorsal stripe is dirty whitish, edged with black, and is on the third and fourth segments continuous, but contracted and expanded, while on the others it is only visible, and expanded towards the end of each segment, excepting the twelfth and thirteenth, where it is widened into a broad blotch, extending to the subdorsal region, and strongly margined with black; from its base on the middle segments is a brownish-grey streak on either side, curved obliquely forward to the middle of the subdorsal line. The tubercular dots whitish, delicately ringed with black, and with minute black centres, each with a short and very fine hair.

The subdorsal line is a very thin thread of dirty whitish, delicately and interruptedly edged with black; the space between it and the spiracular region is greyish-brown, darker than the back, and having a paler blotch in the middle of each segment.

The spiracular stripe is a pale freckled brownish-grey, edged above by a black line; the spiracles dirty whitish, outlined with grey, and inconspicuous. The belly and legs a slightly mottled greenish-grey.

When full-grown, the broad dorsal stripe of dirty whitish appears faintly continuous, and widest in the middle of each segment, and margined at each segmental division before and behind with stout thick black curves.

On the anal extremity a thick cruciform black mark.

Its perfect assimilation to the crevices in the bark of ash trees accounts partly for its remaining so long undiscovered, or at least undescribed, in this country. (W. B., E.M.M., IV, 136, November, 1867.)

TETHEA RETUSA.

Plate LXXXV, fig. 5.

I believe this species is not yet considered to be common, so perhaps it may not be uninteresting to state that we take it here [Exeter] in some seasons, by searching for the larvæ in the folded leaves and shoots of various kinds of willows, about the end of May and beginning of June. At that time of the year, indeed, numbers of common larvæ are to be found in this way, such as *Tæniocampa stabilis*, *T. cruda*, *Orthosia lota*, *Cosmia trapezina*, *Epunda viminalis*, occasionally *Cerastis vaccinii* and *C. spadicea* (these two probably hiding in leaves spun together by other species), and always *Hypsipetes elutaria* and *Cheimatobia brumata*, as well as some of the *Tortrices*; but the only larva with which *T. retusa* is likely to be confounded is that of *E. viminalis*; I have therefore described the former rather fully, and pointed out the characters which distinguish it from the latter.

Tethea retusa, when full-grown, is about an inch in length, tapering slightly towards each end, and flat

beneath; the *head small*, rounded, and rather *flat*; *skin very delicate and thin*, so that the lines on it show almost as if ribbed or raised, and the internal organs partially show through it. The colour is a pale dull green, with a yellow tinge towards the head and tail; a broad dorsal stripe, a fine subdorsal, and an undulating spiracular line, all whitish in colour; the spiracles not visible; the *head generally yellowish-green*, but sometimes very *dark blackish-brown*; occasionally also there is a dark collar on the second segment; *young larvæ* sometimes have the *usual dots*, very visible and black, but *lose all trace of them as they grow bigger*.

The characters printed above in italics distinguish this larva from that of *Epunda viminalis*, which has a much firmer texture of skin, a thicker and more corneous head (which is pale grey with the lobes outlined in black); the lines more sharply defined, and two pairs of whitish dots on the back of each segment. (J. H., October 9, 1867; E.M.M., IV, 180, January, 1868.)

EUPERIA FULVAGO.

Plate LXXXVI, fig. 1.

For many years Sherwood Forest in Nottinghamshire was considered the only British locality where this pretty species could be taken in numbers. There it used to be, and I suppose still is, a most abundant moth. Odd specimens were very occasionally taken in other and very widely separated localities in England and Scotland, but it was not until 1888, when Mr. J. N. Young, of Rotherham, and his friends, took twenty-six specimens in Wadworth Wood, near Doncaster, that another locality was found where it could be relied on to occur in some plenty, as the two seasons which have elapsed since then have sufficiently proved.

By previous arrangement, I met Mr. Young in Wadworth Wood on the 21st of June, 1890, and found that by the time I arrived he had already made a good haul of *Euperia fulvago* larvæ, along with many other species. He had gone the previous evening to "sugar," remained in the wood all night, and commenced to beat for larvæ at daybreak. We set to work together at the birches, and I had before long the satisfaction of finding that the "early bird" had not got quite all "the worms;" for by the time I discontinued beating, a fair number had found their way into my boxes. We were, however, clearly a week too late, as although a few larvæ were small, by far the greater part were quite full-fed, and evidently most had already left the trees.

The full-grown larva is about an inch and a half in length, and of moderate bulk in proportion; head very slightly narrower than the second segment, the lobes round and polished; body cylindrical, and of nearly uniform width throughout; skin soft, and so translucent that the pulsations of the internal vessels can be distinctly seen through it.

Ground colour pale dingy green, with the appearance of having been dusted over with a white powder; head pale yellow, the mandibles black, and on each side, a little above the mandibles, and towards the outside, is a small red spot; medio-dorsal and sub-dorsal lines white; the spiracular stripe is composed of two waved lines, also white; this stripe encloses the spiracles, which are white, edged all round with purple; segmental divisions yellow, this colour showing especially when the larva is crawling.

Ventral area and pro-legs uniformly pale dingy green, the anterior legs still paler, and slightly tipped with black.

The young larvæ found did not appear to differ either in shape or colouring from the adult specimens.

Feeds on birch, and rests coiled round in the middle of a leaf with the head close to the other extremity, just

as does the larva of *Cymatophora flavicornis* when full-grown.

The larvæ all pupated below the surface of the earth in their cage, and the moths emerged from July 25th to August 4th. (G. T. Porritt, April, 1891; E.M.M., XXVII, 121, May, 1891.)

DICYCLA Oo.

Plate LXXXVI, fig. 2.

The furious salt gale of the 29th of April, 1882, damaged the trees in most localities to such an extent that it was a hopeless task to go beating for the larvæ usually taken by that process in May; but of course, there were some trees so situated as to be guarded by high ground from the stroke of the blast, and from one such oak tree my friend, the Rev. John Hellins, was fortunate enough to obtain the larva of this species.

As far as we know, neither the larva nor the imago had been taken in Devonshire before, so it is an addition to the local fauna of that county.

When first taken, 19th of May, it was not come to full growth, being less than an inch in length, and was preparing for a moult, so that its appearance puzzled Mr. Hellins, who sent it to me as perhaps the young stage of some *Tæniocampa*, which he had forgotten, and in this, without closely examining more than the first two segments protruding from some leaves and portending a moult, I acquiesced; however, an examination of the larva after the completion of its moult, and further correspondence, soon convinced me it was no *Tæniocampa*, and reference to a copy which I had by me of Hübner's figure of *D. oo* showed me at once that I had at last obtained an example of that desideratum.

The moult took place during night or early in the morning of May 22nd, and in course of that morning

I saw the larva feeding well as it lay quite openly exposed to view, though afterwards it kept itself more secluded, both by day and night, amongst the leaves of the oak spray provided for it, but, so far as I could see, without spinning them together, and it became full-grown by the 27th, and went to earth on the 29th; and the imago, a male, appeared on the 8th of July.

Very soon after the moult it was nearly an inch long, and when full-grown and stretched out, one inch and four and a half lines in length, very cylindrical, the head being only a trifle less than the second segment, and the thirteenth very little tapered; the head full and rounded, jet-black and glossy; the ground-colouring of the body was also jet-black above as far as the anal flap, which was brown, and dark brown on the belly; the plate on the second segment quite as glossy as the head; the rest of the smooth skin had but a very slight gloss; a pure white dorsal stripe began rather narrow on the plate and thoracic segments, and from thence much broader on all the others, but on each of them was contracted in the middle and divided so as to form a series of long elliptical marks; the very thin subdorsal line of pure white began with two isolated spots on the side margin of the neck plate, and thence ran uninterrupted to the end of the anal flap; the broad spiracular stripe of rather yellowish-white was on the third and fourth segments interrupted deeply on its upper margin, and from them passed along of uniform breadth as far as the anal legs, and having a thin line of dark grey running through the middle, on which were the spiracles of red-brown finely outlined with black; the very small tubercular dots of pure white ranged in threes on either side of the back, and singly above and below the spiracular region on each segment; the anterior legs were black; the ventral and anal legs brownish-green and semi-pellucid; the thoracic wrinkles and segmental divisions showed black upon the white stripes and lines.

Just before the larva was allowed to enter the earth it had lost its perfect black ground on the body, which had become somewhat of a brownish-green.

The cocoon, found about three-quarters of an inch below the surface of the earth, was of oblong shape, the diameters eleven lines by eight; it was composed of earthy particles lightly held together with a few threads, and though smooth inside, was without any perceptible lining of silk.

The pupa skin was seven lines long, very stout in proportion across the thorax; the abdominal segments tapered to the rounded tip furnished with two very fine straight and pointed spines, smooth in all its parts; of a dark warm brown colour and glossy. (W. B., 6th December, 1882; E.M.M., XIX, 203, February, 1883.)

COSMIA DIFFINIS.

Plate LXXXVI, fig. 4.

Two full-grown larvæ received from Mr. Henry Bartlett, feeding on elm, June 8th, 1875. When at rest they lay curved round on the under side of a leaf. One, the most mature, measured in length one and three-eighths, the other one and one-eighth of an inch; slender in proportion, cylindrical, tapering very slightly just near each extremity. The head full and rounded in size, a trifle less than the second segment; all the legs well developed; skin rather wrinkled transversely. In colour the head is very dark rich brown, becoming nearly black on the lower portions; antennal papillæ pale green at the base. The colour of the body pale green, but not bright, rather inclining to glaucous in front and a trifle yellower behind. The largest larva was rather yellower green, and paler than the other. The dorsal line is of a whitish-buff tint or pale buff; the subdorsal line whitish and ragged in character, finely edged with darkish bluish-green, especially

above; the subspiracular stripe light sulphur-yellow; the belly and ventral legs rather paler green than the back; the tubercular dots whitish-buff, with minute blackish centre; the spiracles dark brownish-red, finely outlined with black; the hairs of all the dots exceedingly fine and soft. These larvæ disliked being exposed, and were only quiet when they could get on the under side of a leaf. The anterior legs black on their outer surfaces, or else entirely, and shining. The surface of the second segment shining. One larva died, and one spun up between two elm leaves in a thin silken cocoon scarcely to be so called. The pupa rather over half an inch long, thick and stumpy in figure, rather rounded in character anteriorly, and tapering suddenly to the anal tip, which ends in two curly-topped spines, which are fixed or held fast in a rather dense patch of silk spun on the leaf in the cavity or rounded-over chamber formed by spinning the leaves together; the chamber is not otherwise lined; the surface of the pupa appears of a violet tint and dull from being covered with a bloom or dust. The moth emerged on the 1st of August. (W. B., 1875, Note Book II, 194, 199.)

COSMIA AFFINIS.

Plate LXXXVI, fig. 5.

On the 5th June, 1886, I received three larvæ of this species from the Rev. G. H. Raynor, of Cambridge. They were feeding on elm, and two days later I described them as follows:

Length rather over an inch, and of average proportionate bulk; head glossy, the lobes rounded, about the same width as the second, but narrower than the third and following segments; body cylindrical, but has an uneven appearance, owing to the clearly-cut segmental divisions; it tapers from the fifth segment to the head, and the thirteenth segment shelves off abruptly from

above, and appears much narrower than those preceding it; skin soft, and sufficiently transparent for the working of the internal organs to be seen through it. Ground colour bright pale green, the head with a slight yellow tinge; dorsal stripe clear white, as are also the narrower subdorsal stripes; spiracular stripes also white, but having a faint yellowish tinge which is wanting in the other stripes, and above them, in one of the specimens, is an irregularly defined stripe of dark green, which, on the second, third, and fourth segments, takes the form of black streaks; the large round spiracles are white, enclosing an intensely black spot, and immediately over, but touching each spiracle, is another considerably smaller white spot, which also encloses a minute but equally black dot; the rather small tubercular spots are white. Ventral surface and pro-legs uniformly light green; the anterior legs on the outside are black, ringed with whitish.

In a few days the larvæ spun rather loose cocoons under the leaves or moss at the bottom of their cage, and two moths emerged on July 19th and 22nd respectively. (G. T. Porritt, May 11th, 1889; E.M.M., XXV, 298, June, 1889.)

The following list of parasites, bred from the larvæ or pupæ of the species included in the present volume, has been kindly prepared by Mr. G. C. Bignell, F.E.S.
—R. McL.

HOST.	PARASITE.	By whom bred.
<i>Agrotis exclamationis</i> .	<i>Amblyteles Panzeri</i> , Wesmael ...	W. Buckler.
	<i>Mesoleptus cingulatus</i> , Gravenhorst	R. South.
„ <i>tritici</i>	<i>Rhogas dimidiatus</i> , Spinola.....	J. Hellins.
	<i>Meteorus leviventris</i> , Wesmael...	G. C. Bignell.
„ <i>agathina</i>	<i>Limneria ruficincta</i> , Gravenhorst	Bignell.
	<i>Rhogas circumscriptus</i> , Nees.....	Bignell.
„ <i>porphyrea</i>	<i>Meteorus pulchricornis</i> , Wesmael	J. H. Wood.

HOST.	PARASITE.	By whom bred.
<i>Agrotis præcox</i>	<i>Ophion luteus</i> , Linné	Bignell.
	<i>Apanteles ruficrus</i> , Haliday	G. T. Porritt.
	„ <i>spurius</i> , Wesmael... {	Porritt,
	„ <i>difficilis</i> , Nees	Bignell.
„ <i>Ashworthi</i>	<i>Amblyteles armatorius</i> , Forster	C. S. Gregson.
	<i>Ichneumon primatorius</i> , Forster	Gregson.
<i>Triphaena fimbria</i>	<i>Ichneumon gracilentus</i> , Wesmael	Mrs. Norgate.
	„ <i>primatorius</i> , Forster	Bignell.
	<i>Amblyteles notatorius</i> , Fabricius	Bignell.
	<i>Campoplex mixtus</i> , Gravenhorst	J. M. Young.
	<i>Lissonota sulphurifera</i> , Gravenhorst	South.
	<i>Apanteles fulvipes</i> , Haliday	Bignell.
„ <i>orbona</i>	<i>Amblyteles armatorius</i> , Forster	Bignell.
	<i>Apanteles callidus</i> , Haliday	Bignell.
	„ <i>fulvipes</i> , Haliday	Bignell.
„ <i>pronuba</i> ...	<i>Amblyteles armatorius</i> , Forster	E. A. Butler.
<i>Noctua plecta</i>	<i>Cryptus obscurus</i> , Gravenhorst	J. Sang.
„ <i>triangulum</i> ...	<i>Limneria Brischkei</i> , Bridgman	Bignell.
	* <i>Mesochorus formosus</i> , Bridgman	Bignell.
	<i>Macrocentrus collaris</i> , Spinola...	Bignell.
„ <i>brunnea</i>	<i>Ichneumon multiannulatus</i> , Gravenhorst	Bignell.
	<i>Ichneumon leucomelas</i> , Gmelin.	Bignell.
	<i>Amblyteles margineguttatus</i> , Gravenhorst	Bignell.
	<i>Phytodietus coryphæus</i> , Gravenhorst	T. R. Billups.
	<i>Meteorus luridus</i> , Ruthe	Mrs.
		Hutchinson.
„ <i>festiva</i>	<i>Ichneumon gracilentus</i> , Wesmael	B. A. Bower.
„ <i>neglecta</i>	<i>Rhogas circumscriptus</i> , Nees ...	Bignell.
„ <i>xanthographa</i>	<i>Apanteles fulvipes</i> , Haliday	Bignell.
<i>Trachea piniperda</i> ...	<i>Henicospilus ramidulus</i> , Linné .	F. Norgate.
	<i>Anomalon xanthopus</i> , Schrank...	Bridgman.
	<i>Campoplex rugulosus</i> , Förster	Norgate.
	<i>Banchus moniliatus</i> , Gravenhorst	Bignell.
<i>Tæniocampa gothica</i> ...	<i>Anomalon arquatum</i> , Gravenhorst	Bignell.
„ <i>instabilis</i>	<i>Microplitis vidua</i> , Ruthe.....	Bignell.
„ <i>populeti</i> .	<i>Cryptus obscurus</i> , Gravenhorst..	Harwood.
	<i>Ophion luteus</i> , Linné.....	Bignell.
	<i>Campoplex pugillator</i> , Linné ...	Bignell.
	„ <i>confusus</i> , Förster ...	Bignell.
	„ <i>ebeninus</i> , Gravenhorst	Mrs.
		Hutchinson.

* Hyperparasite on *M. collaris*.

HOST.	PARASITE.	By whom bred.
<i>Tæniocampa populeti</i> .	<i>Cryptopimpla</i> = <i>Phytodietus</i> <i>plantarius</i> , Gravenhorst	Harwood.
„ <i>stabilis</i> ...	<i>Exorista vulgaris</i> , Fallén	Bignell.
	<i>Amblyteles alticola</i> , Gravenhorst	Bignell.
	* <i>Limneria Kriechbaumeri</i> , Bridg- man	Bignell.
	„ <i>interrupta</i> , Holmgrén	Bignell.
	† <i>Mesochorus strenuus</i> , Holmgrén	Bignell.
	<i>Rhogas circumscriptus</i> , Nees ...	Bignell.
	<i>Apanteles solitarius</i> , Ratzeburg	Bignell.
	„ <i>formosus</i> , Wesmael ...	Bignell.
	<i>Meteorus pulchricornis</i> , Wesmael	Bignell.
	<i>Microplitis mediana</i> , Ratzeburg	Bignell.
	<i>Exorista vulgaris</i> , Fallén	Bignell.
	„ <i>lota</i> , Meigen	C. W. Dale.
„ <i>gracilis</i>	<i>Limneria Kriechbaumeri</i> , Bridg- man	Bignell.
	<i>Agrypon flaveolatum</i> , Graven- horst	Bignell.
„ <i>miniosa</i> .	<i>Apanteles solitarius</i> , Ratzeburg	Bignell.
	† <i>Microplitis tuberculifera</i> , Wes- mael	Bignell.
„ <i>cruda</i> ...	<i>Cryptus obscurus</i> , Gravenhorst	T. A. Marshall.
	<i>Meteorus unicolor</i> , Wesmael . {	R. M. Sotheby, Butler.
<i>Orthosia ypsilon</i>	<i>Ophion obscurum</i> , Fabricius ...	Harwood.
„ <i>lota</i>	<i>Perilitus unicolor</i> , Wesmael.....	Bignell.
<i>Cerastis spadicea</i>	<i>Microplitis mediator</i> , Haliday ...	Bignell.
<i>Scopelosoma satellitia</i> .	<i>Meteorus ictericus</i> , Nees	Hellins.
<i>Xanthia citrago</i>	<i>Campoplex nobilitatus</i> , Holm- grén	Harwood.
<i>Tethea retusa</i>	<i>Apanteles</i> * <i>sericeus</i> , Nees	Bignell.
	„ <i>nothus</i> , Reinhard.....	Bignell.
	<i>Meteorus unicolor</i> , Wesmael.....	Bignell.
	„ <i>deceptor</i> , Wesmael.....	South.
<i>Cosmia trapezina</i>	<i>Paniscus virgatus</i> , Fourcroy.....	Bignell.
	<i>Meteorus pulchricornis</i> , Wesmael	Bignell.

* Cocoon egg-shaped, brown with a white central band, very slightly suspended by a single thread from a leaf, falls to the ground in a few days, has the power to bound like a ball, sometimes covering a distance of from three to four feet; the object, no doubt, is to find a resting-place between fallen leaves or among stones.

† Hyperparasite on *Limneria Kriechbaumeri*.

‡ Singly from larva not half grown.

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PLATE LXX.

RUSINA TENEBROSA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ after last moult, reared from eggs on lettuce, knot-grass, dock, plantain, vetch, &c., October 17th, 1863.

AGROTIS VALLIGERA.

2, 2 *a*, 2 *b*, larvæ after last moult; on *Galium* and chickweed, May 11th, 1861; under ragwort, July 4th, 1860; imago August 20th, 1860.

AGROTIS PUTA.

3, 3 *a*, 3 *b*, 3 *c*, reared from eggs on lettuce and root of garden carrot; figured October 21st and November 8th, 1867; full grown December 24th, 1867.

See pp. 1—3.

AGROTIS SUFFUSA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ after last moult; at mangold-wurzel, June 22nd; imago July 26th, 1870.

AGROTIS SAUCIA.

5, 5 *a*, 5 *b*, 5 *c*, reared from eggs laid September 30th, hatched October 4th, 1865; 5 *a* figured November 13th; 5, December 2nd; 5 *b*, December 9th; 5 *c*, December 18th; fed on dock and narrow-leaved plantain; moths out end of June, 1866.





F.C. Moore lith.

W. BUCKLER del.

West, Newman imp.

PLATE LXXI.

AGROTIS SEGETUM.

1, 1 *a*, 1 *b*, larvæ after last moult; 1 dug up in garden March 6th, 1859, imago emerged June 18th; 1 *a* from Wakefield, under turnip and dock, April 8th, 1869, imago emerged June 29th; 1 *b* fed on plantain, May 23rd, 1861, imago emerged July.

AGROTIS LUNIGERA.

2, 2 *a*, 2 *b*; 2 *a* found under marine goosefoot and grasses near Emsworth, October 9th, 1877; 2, figured September 8th, and 2 *b*, figured November 4th, 1866, are different stages of the same larva fed on knot-grass.

See pp. 3—7.

AGROTIS EXCLAMATIONIS.

3, 3 *a*, 3 *b*, larvæ after last moult; 3, on grass, lettuce, and chickweed, larva figured April 26th, 1860, imago emerged July 14th; 3 *a*, under chickweed, October 11th, 1873; 3 *b*, from Wakefield, at turnip and other roots, April 5th, imago emerging July 7th, 1869.

See pp. 7—9.

AGROTIS CORTICEA.

4, 4 *a*, 4 *b*, larvæ after last moult, reared from the egg on goosefoot; 4 and 4 *b* figured October 4th, 1870, 4 *a*, on April 29th, 1871, imago emerging June 27th.

See pp. 9—12.

AGROTIS CINEREA.

5, 5 *a*, larvæ after last moult.

See pp. 12—16.

AGROTIS RIPE.

6, 6 *a*, 6 *b*, larvæ after last moult, on *Cynoglossum officinale*.

AGROTIS CURSORIA.

7, 7 *a*, 7 *b*, 7 *c*, larvæ on *Aira præcox* and other small seaside grasses, June 8th, 1861, imagos emerging July 29th; and on *Arenaria peploides*, *Viola Curtisii*, etc., June 17th to 24th, 1870, imagos emerging August 1st to 3rd, 1870.

See pp. 17, 18.

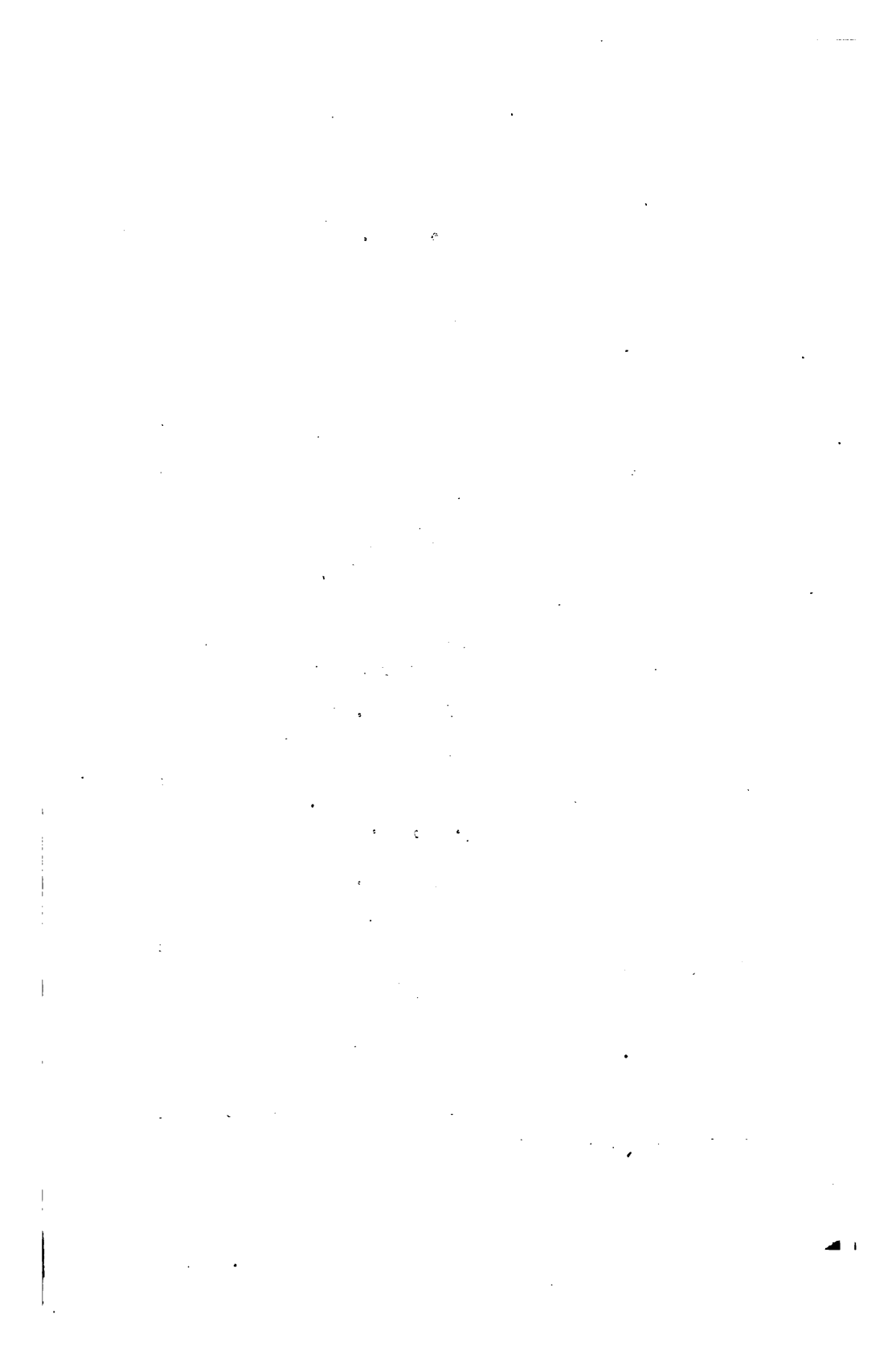


PLATE LXXII.

AGROTIS NIGRICANS.

1, 1 *a*, 1 *b*, 1 *c*, larvæ after last moult; 1 and 1 *c* from Matching Hall, Essex, on clover, May 15th, imago emerged July 20th, 1865; 1 *b* figured May 30th, imago emerged July 27th, 1872; 1 *a* from Suffolk, four larvæ under narrow-leaved plantain, chickweed, and clover, May 15th, imago emerged July 15th, 1865.
See pp. 19, 20.

AGROTIS TRITICI.

2, 2 *a*, 2 *b*, 2 *c*, larvæ after last moult; 2 figured June 28th, 1872; 2 *a*, on *Galium*, figured May 18th, imago emerged August 9th, 1861; 2 *c* on yarrow, May 3rd, imago emerged August, 1861.

AGROTIS AQUILINA.

3, larva after last moult, figured May 15th, one of three larvæ on clover and plantain, chickweed, etc., imago emerged July 24th to 27th, 1865.
See pp. 20, 21.

AGROTIS OBELISCA.

4, 4 *a*, larvæ after last moult, on *Helianthemum vulgare*, figured June 6th, imago emerged August 10th, 1870.

See pp. 21, 22.

AGROTIS AGATHINA.

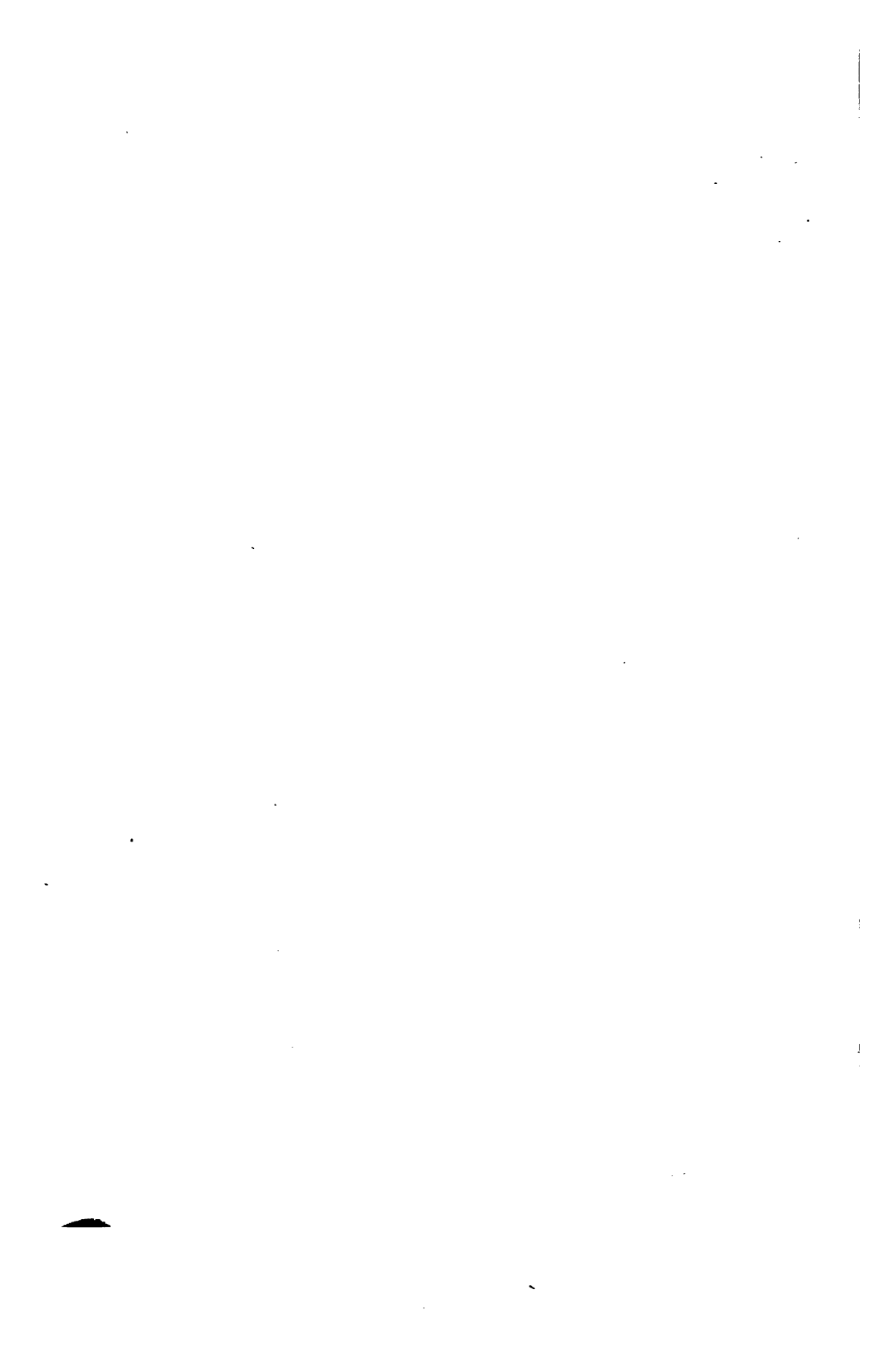
5, 5 *a*, 5 *b*, 5 *c*, larvæ after last moult, feeding on heather, May 25th, 1861, June 10th and 18th, 1869, and May 26th, 1874.

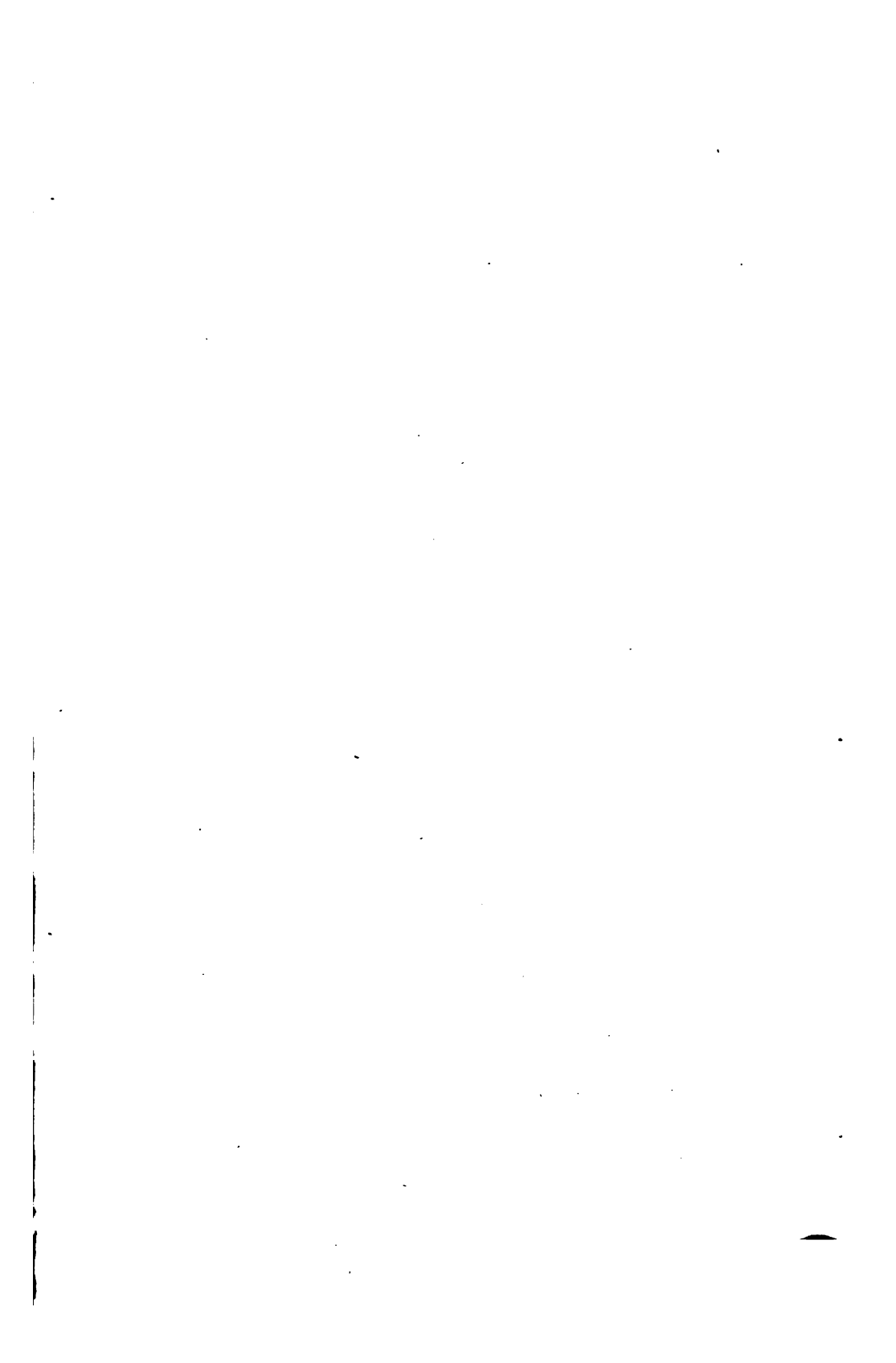


F.C. Moore lth.

W. BUCKLER del.

West, Newman imp.







F.C. Moore lith.

W. BUCKLER del.

West Newman imp.

PLATE LXXIII.

AGROTIS PORPHYREA.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, larvæ after last moult; 1 on fine grass and heath, figured April 13th, 1873; 1 *a*, February 27th, 1868; 1 *c*, February 17th, and 1 *d*, March 19th, 1862.

AGROTIS PRÆCOX.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, larvæ after last moult; on fine marine grass and dwarf willow, eating also weeping willow, June 8th, 1861, imago emerging August 8th; on osier, willow, willow, June 21st, imago emerging July 31st to August 12th, 1864; and one on osier, June 10th, imago emerging July 29th, 1872.

AGROTIS RAVIDA.

3, 3 *a*, 3 *b*, 3 *c*, larvæ after last moult; at roots of dandelion and thistle, eating the leaves of dandelion, May 6th, 8th, and 18th, imago emerging July 8th, 1865.

See pp. 22—25.

AGROTIS LUCERNEA.

4, 4 *a*, larvæ after last moult; on lesser saxifrage, oxlip, and chickweed, April 25th and May 1st, imago emerging July 15th, 1862; and on *Sedum acre*, April 5th, imago emerging July 9th, 1867.

AGROTIS ASHWORTHII.

5, 5 *a*, larvæ after last moult; fed on willow and catkins, heather, and other small wild hill plants, May 2nd, 1862.

PLATE LXXIV.

TRIPHÆNA IANTHINA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ after last moult; 1 *a* on black-thorn, May 12th, 1860; 1 *b* figured March 27th, 1875, female imago emerging June 30th, 1875; 1 *c* one of two found small on February 27th, eating opening buds of elm suckers, fed up on dock, sallow, thorn, etc., and imago emerging July 12th, 1872.

TRIPHÆNA FIMBRIA.

2, 2 *a*, 2 *b*, larvæ after last moult; 2 beaten from sallow bloom April 7th, fed on flowers, buds, and shoots of sallow, full grown and figured May 12th, imago emerged July 20th, 1860; 2 *b*, fed on sallow and dock, figured May 12th, 1875, imago, ♀, emerged July 7th, 1875.

TRIPHÆNA INTERJECTA.

3, 3 *a*, 3 *b*, larvæ after last moult; 3 on *Potentilla fragariastrum*, May 11th, imago emerged July 18th, 1861; 3 *a* figured April 17th, 1868; 3 *b* feeding on grasses, May 21st, 1869.

TRIPHÆNA SUBSEQUA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ reared from the egg; 4 figured November 13th, 4 *c*, December 7th, and 4 *a*, December 15th, 1871; 4 *b*, March 29th, imago emerged June 20th, 1875.

See pp. 25—28.

TRIPHÆNA ORBONA.

5, 5 *a*, 5 *b*, 5 *c*, 5 *d*, 5 *e*, larvæ in various stages; 5 on broom; 5 *d*, May 13th, 1868; 5 *b* and 5 *c* feeding on sallow and dogwood, imagos emerged July 15th to 20th, 1861; 5 *e* on garden thyme, November 16th, 1864, after hybernation fed up on dock and chickweed, full grown April 17th, 1865, imago July 29th, 1865.

See pp. 28, 29.

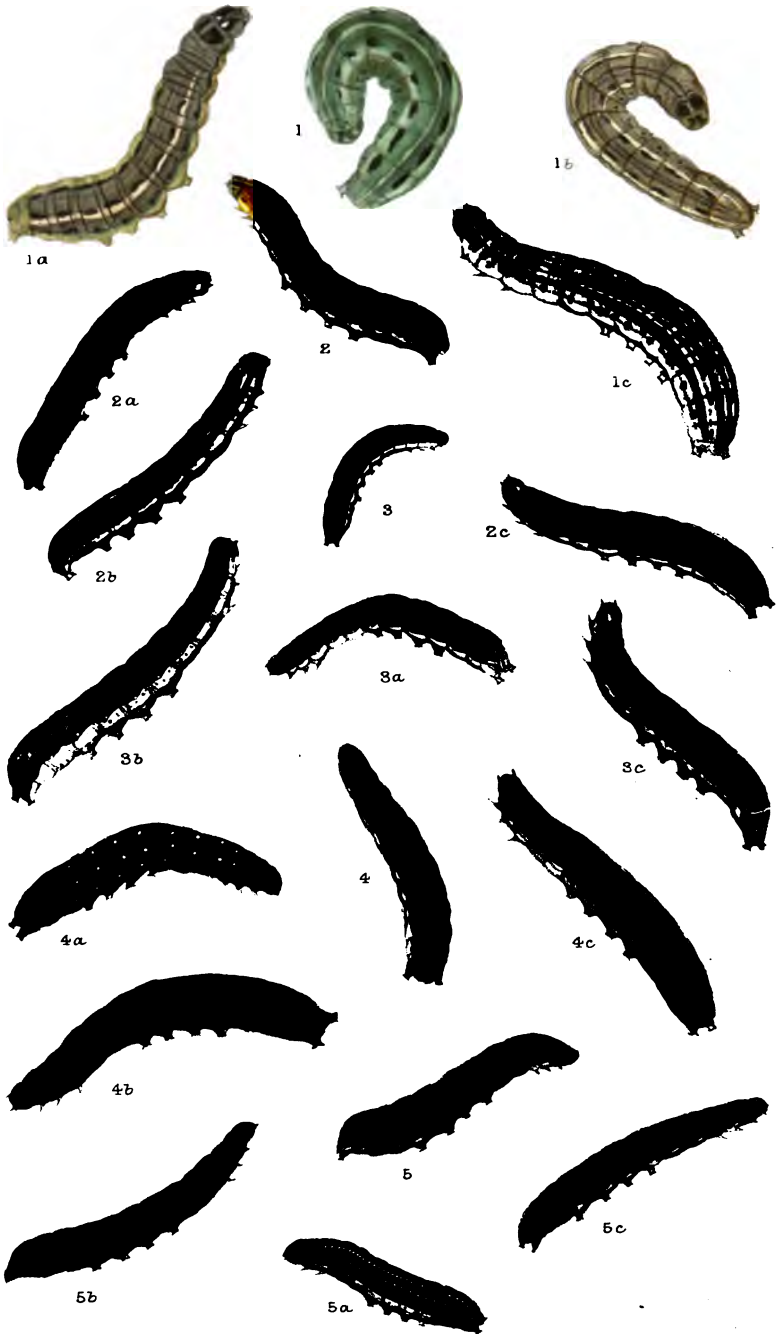


F.C. Moore lith.

W. BUCKLER del.

West Newman imp.





F.C. Moore lith.

W. BUCKLER del.

West, Newman imp.

PLATE LXXV.

TRIPHÆNA PRONUBA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ after last moult; 1 on buttercup, figured October 11th, 1860; 1 *a* on chickweed, dock, plantain, etc., November 19th, 1860; 1 *b*, October 8th, 1859; 1 *c* on dock and grass, April 28th, 1861, imago emerging July 18th.

See pp. 29—32.

NOCTUA GLAREOSA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ after last moult; 2, 2 *b*, 2 *c*, feeding on dock and chickweed, April 5th, 1862; 2 *a* on *Galium*, dock, and grass, April 30th, 1866.

NOCTUA DEPUNCTA.

3, 3 *a*, 3 *b*, 3 *c*, larvæ in various stages; on leaves and flowers of cowslip and on nettle, May 19th, 1864, and May 10th to 22nd, 1865, imagos appearing July 27th to August 3rd, 1865.

NOCTUA AUGUR.

4, 4 *a*, 4 *b*, 4 *c*, larvæ after last moult; 4, 4 *b*, and 4 *c* on hawthorn, willow, etc., April 25th, imago appearing June 17th, 1861; 4 *a* on dock and hawthorn, figured April 22nd, imago, ♀, appearing June 19th, 1876.

NOCTUA PLECTA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages; feeding on plantain, dock, groundsel, and chickweed; 5 figured October 9th, 1862.

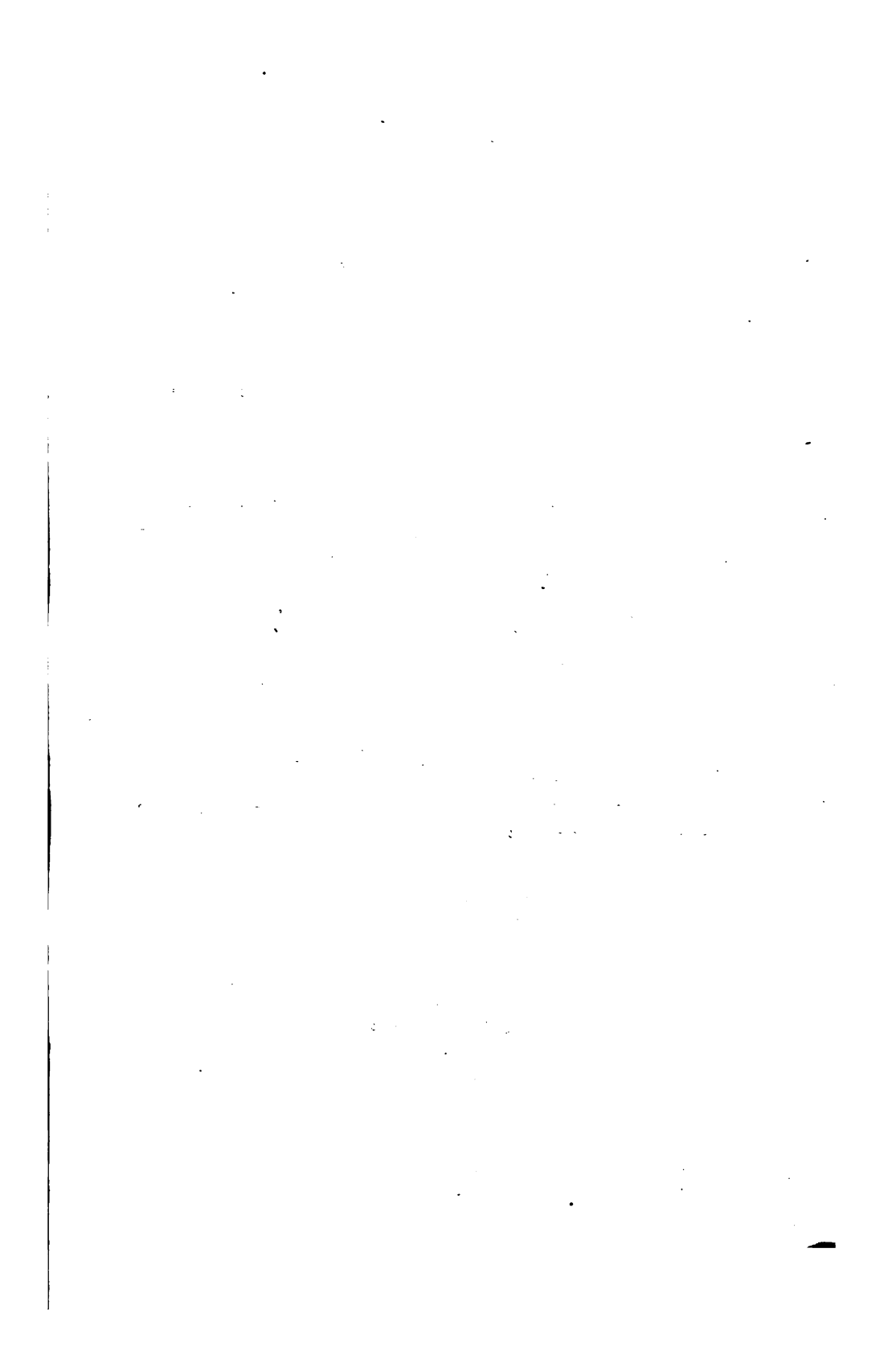


PLATE LXXVI.

NOCTUA C-NIGRUM.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, larvæ in various stages, feeding on dock, plantain, chickweed, and groundsel; 1 *a* on dock, figured April 30th, imago emerged June, 1866; 1 *d* beaten from low plants, September 18th, 1880.

NOCTUA DITRAPEZIUM.

2, 2 *a*, 2 *b*, 2 *c*, larvæ after last moult; 2, 2 *b*, 2 *c*, feeding on dock, sallow, primrose, bramble, and chickweed, April 28th, imagos emerged July 5th to 12th, 1862; 2 *a* found on bramble, ate sallow and dock, May 2nd, imago emerged July 5th, 1868.

See pp. 32—34.

NOCTUA TRIANGULUM.

4, 4 *a*, 4 *b*, 4 *c*, larvæ in various stages of growth, on sallow, thorn, etc., April 30th, imago emerged June 23rd, 1861; and on dock, chickweed, wood-spurge, March 13th to 25th, 1862.

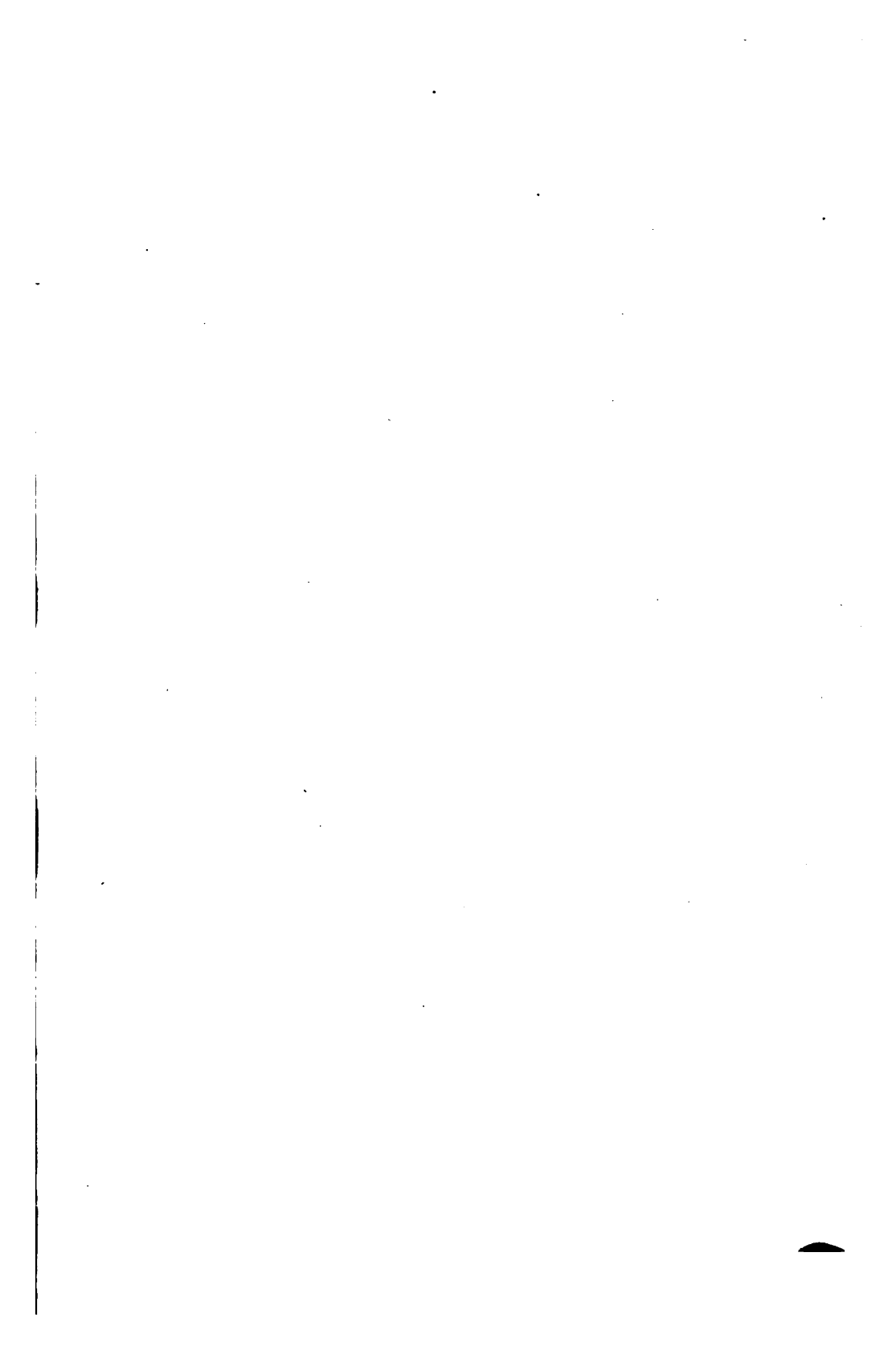
NOCTUA RHOMBOIDEA.

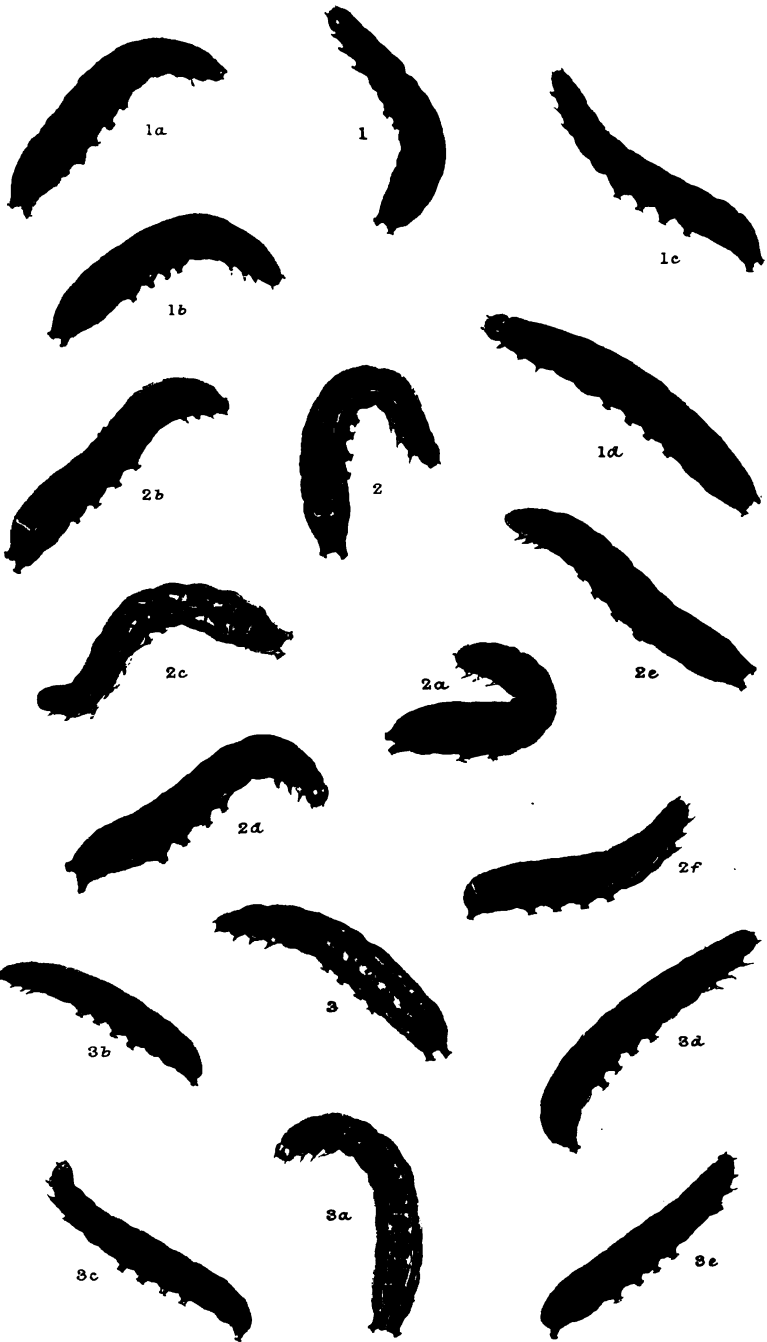
3, 3 *a*, 3 *b*, 3 *c*, larvæ in various stages of growth; 3 *c* and 3 *a*, March 7th, 1871; 3 and 3 *b* on sallow, dock, chickweed, primrose, January 11th to February 8th, imago appearing June 14th, 1862.

NOCTUA BRUNNEA.

5, 5 *a*, 5 *b*; on sallow and thorn, April 17th to 25th, imagos emerging June 16th to 20th, 1861.







FC Moore lith.

W. BUCKLER del.

West Newman imp.

PLATE LXXVII.

NOCTUA FESTIVA.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, larvæ in various stages, on hawthorn, bilberry, primrose, dock, and willow; 1 *a*, April 30th and May 19th, imago June 5th to 8th, 1870.

NOCTUA CONFLUA.

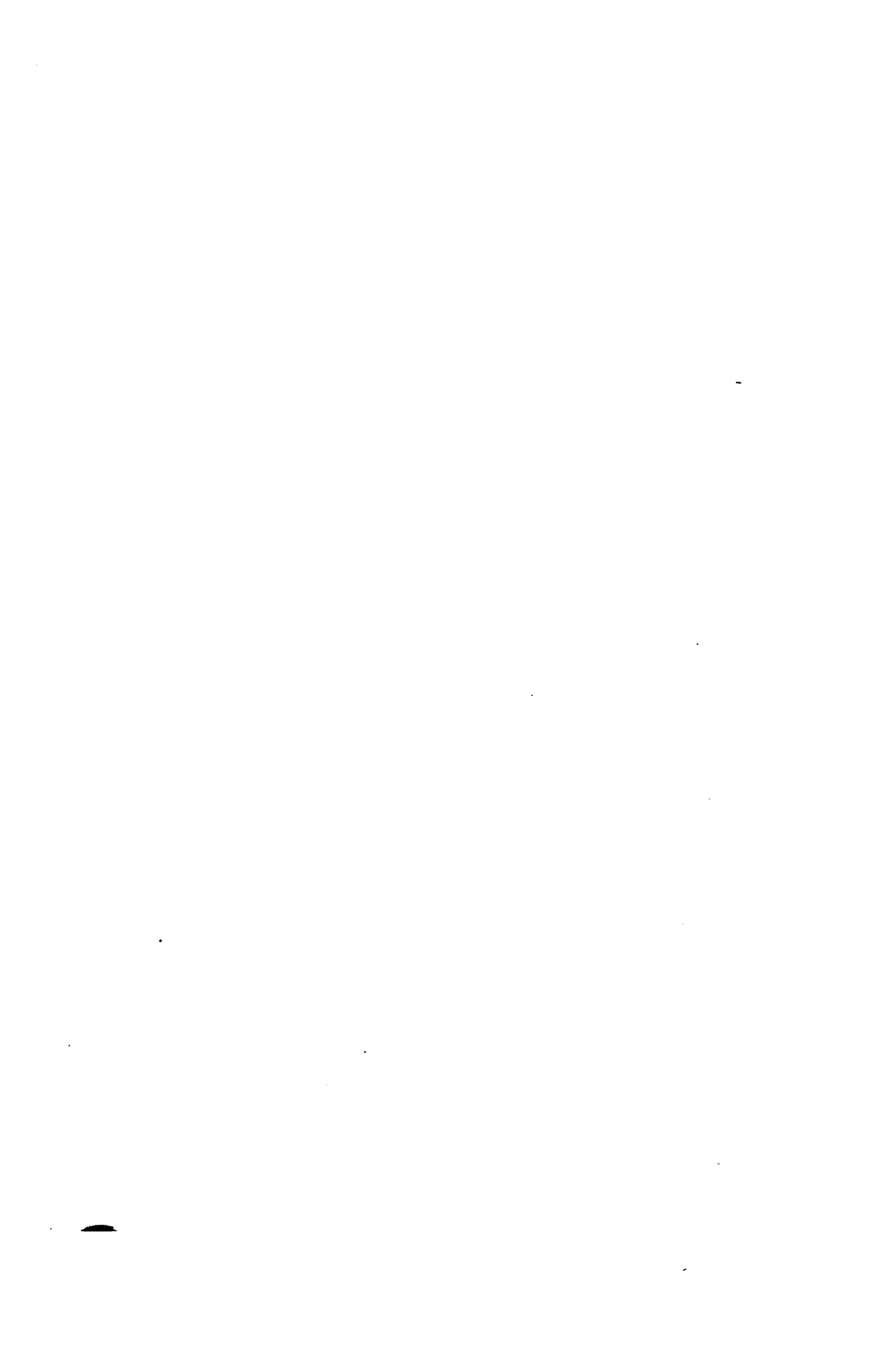
2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, 2 *e*, 2 *f*, larvæ after last moult, from eggs sent from Morayshire; 2 *d* figured March 13th, 1871, imago May 14th; 2 *f* full fed November 21st, 1870, imago May 6th, 1871; the others figured March 14th, April 10th and 13th, 1871, imagos May 23rd to June 19th, 1871.

See pp. 34—36.

NOCTUA DAHLII.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, 3 *e*, larvæ after last moult, reared from eggs November 22nd to 30th, 1868, and April 17th, 1869, on dock, imagos appearing January 19th to April 29th, and from June 4th to 29th, 1869; 3 *e* found small under a dead leaf, reared to full growth on dock, and figured June 10th, 1875, imago July 21st, 1875.

See pp. 37—40.



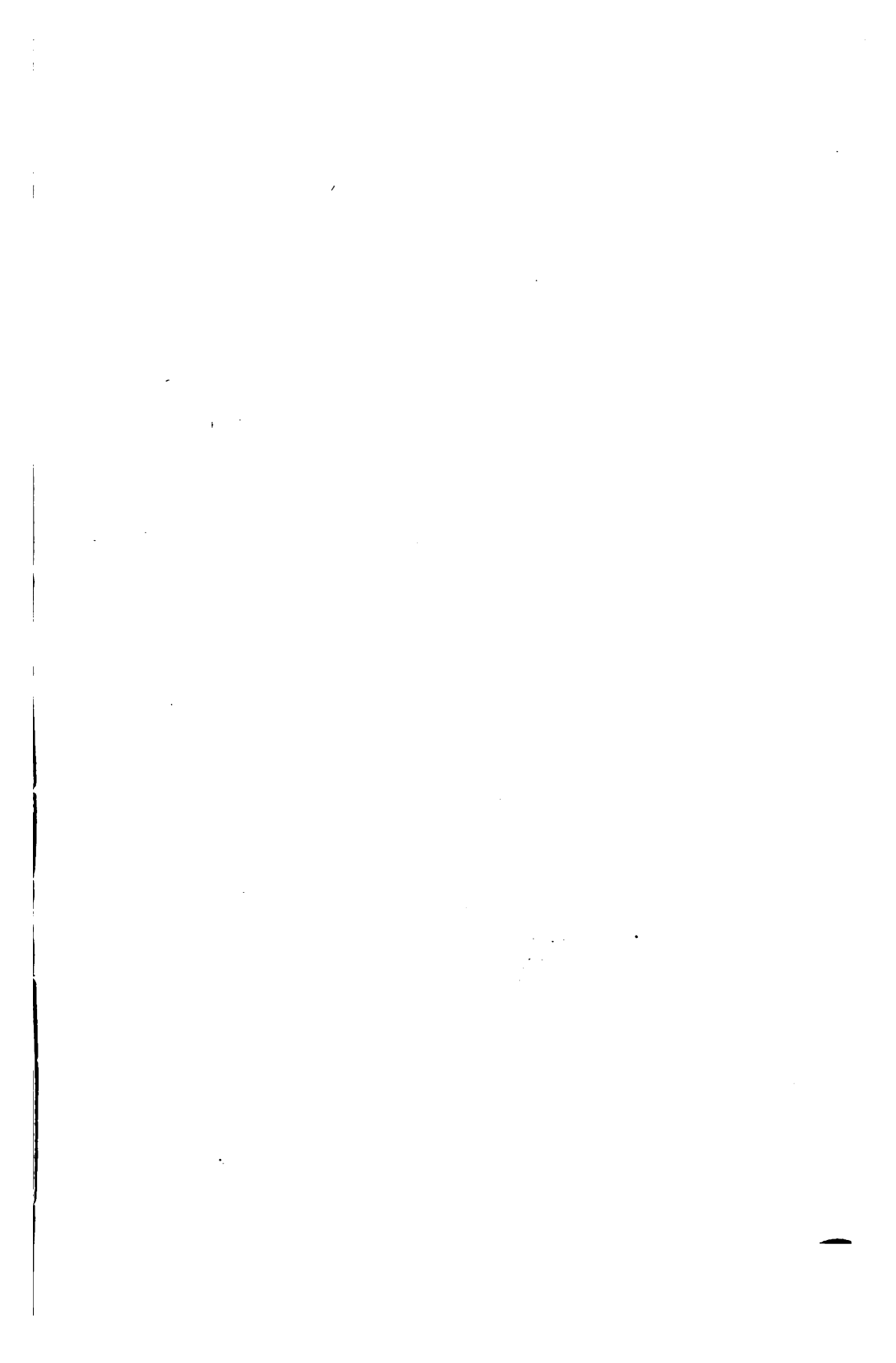


PLATE LXXVIII.

NOCTUA BELLA.

1, 1 *a*, 1 *b*, 1 *c*, 1 *d*, 1 *e*, larvæ after last moult; feeding on dock and chickweed, February 21st, 1862, one on grass, March 28th, 1862; 1 found on grass February 19th, was figured March 6th, imago appearing May 25th, 1865; 1 *c* on heather, afterwards on dock, etc., figured March 9th, imago, ♀, appearing May 27th, 1874.

See pp. 40, 41.

NOCTUA UMBROSA.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, 2 *e*, larvæ after last moult, reared from the egg, on dock, etc., November 19th to 27th, 1870, to March 13th, 1871, imagos June 8th to 13th, 1871.

See pp. 41—45.

NOCTUA BAJA.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, 3 *e*, 3 *f*, 3 *g*, larvæ in various stages, on willow and hawthorn; 3 figured April 22nd, imago July 4th, 1868; 3 *a* imago July 9th, 1868; 3 *d* figured April 9th, imago July 16th, 1868; 3 *g* figured May 18th, 1866; 3 *b*, 3 *c* figured April 25th to May 11th, imago July 1st to 18th, 1861.

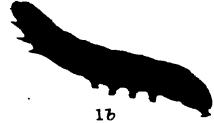




1



1a



1b



1c



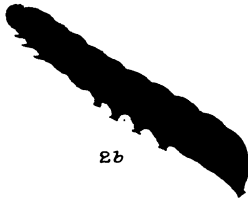
2a



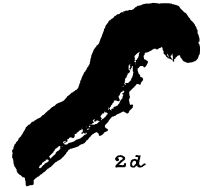
2c



2



2b



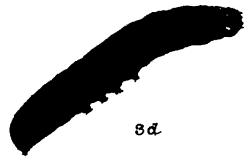
2d



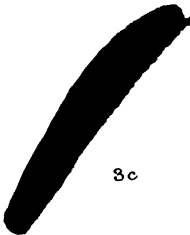
3



3b



3d



3c



3a



3e

PLATE LXXIX.

NOOTUA SOBRINA.

1, 1 *a*, 1 *b*, 1 *c*, larvæ in various stages; 1 and 1 *b* from eggs on heather, birch, and willow; 1 figured November 24th, 1874, natural size; 1 *b* figured December 11th, 1874, magnified.

See pp. 45—48.

NOOTUA NEGLECTA.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, larvæ in various stages; 2 *a* from Forres, May 8th, 1876; the others on heath and willow, figured May 25th, 1861, and May 29th, 1862.

NOOTUA XANTHOGRAPHA.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, 3 *e*, larvæ in various stages; 3 figured March 10th, 1868; 3 *a* and 3 *e*, on primrose and dock, figured April 12th, imago August 25th, 1860; 3 *c* and 3 *d*, on grass, figured April 2nd and 15th, imagos August 27th and 29th, 1861; 3 *b* on willow and oak, May 11th, imago August 31st, 1868.

PLATE LXXX.

TRACHEA PINIPERDA.

1, 1 *a*, 1 *b*, larvæ half grown and after last moult, on Scotch fir, June 9th, 1865, imago April 19th, 1866.

PACHNOBIA ALPINA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ in various stages, on bilberry, heather tops, crowberry, and *Arbutus unedo*, from T. W. Salvage, figured June 21st, 28th, 29th, and July 3rd.

See pp. 48—52.

TÆNIOCAMPA GOTHICA.

3, 3 *a*, 3 *b*, larvæ after last moult, 3 *b* slightly magnified; about 100 larvæ reared in 1858 from eggs laid by a ♀ taken on sallow bloom in April; when hatched they were blue-green with black heads; full fed 21st June; fed entirely on sallow, having refused broom, clover, and lilac; they would eat willow, but preferred sallow.

See pp. 53, 54.

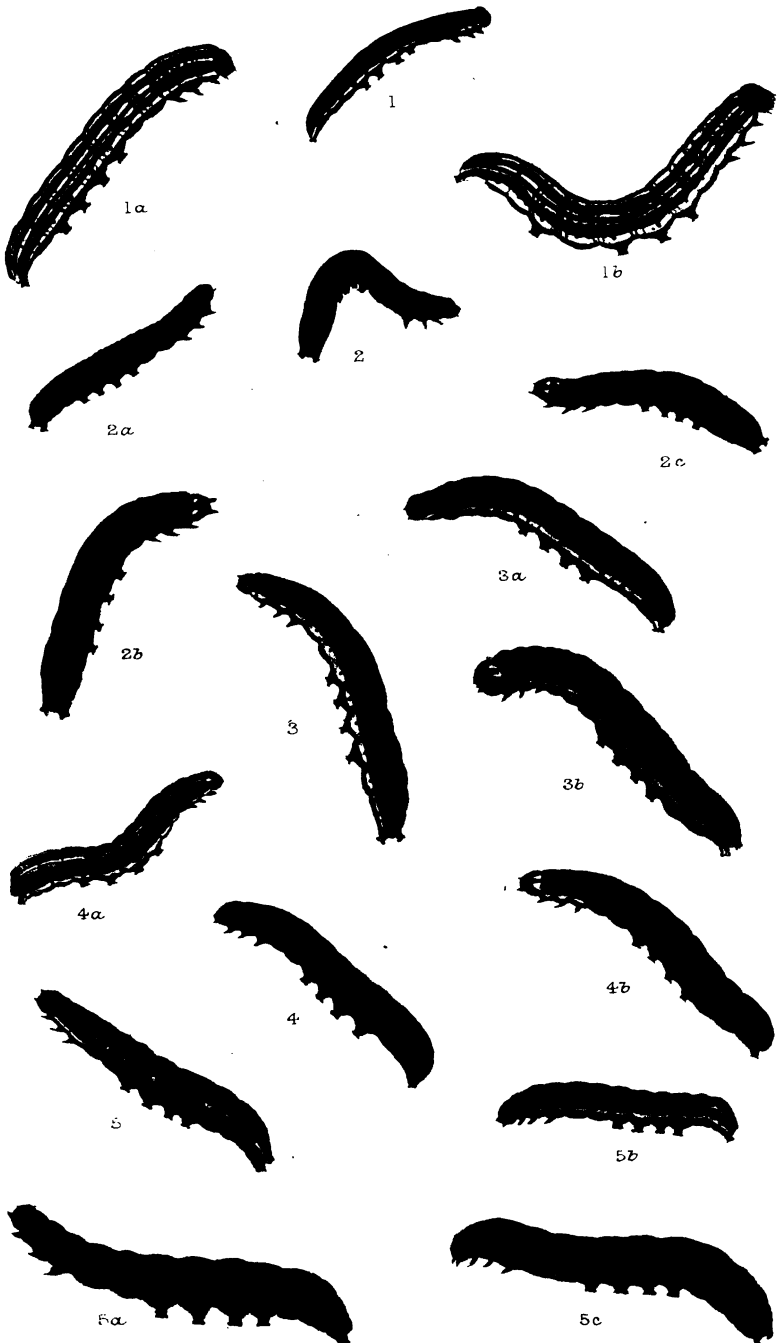
TÆNIOCAMPA LEUCOGRAPHA.

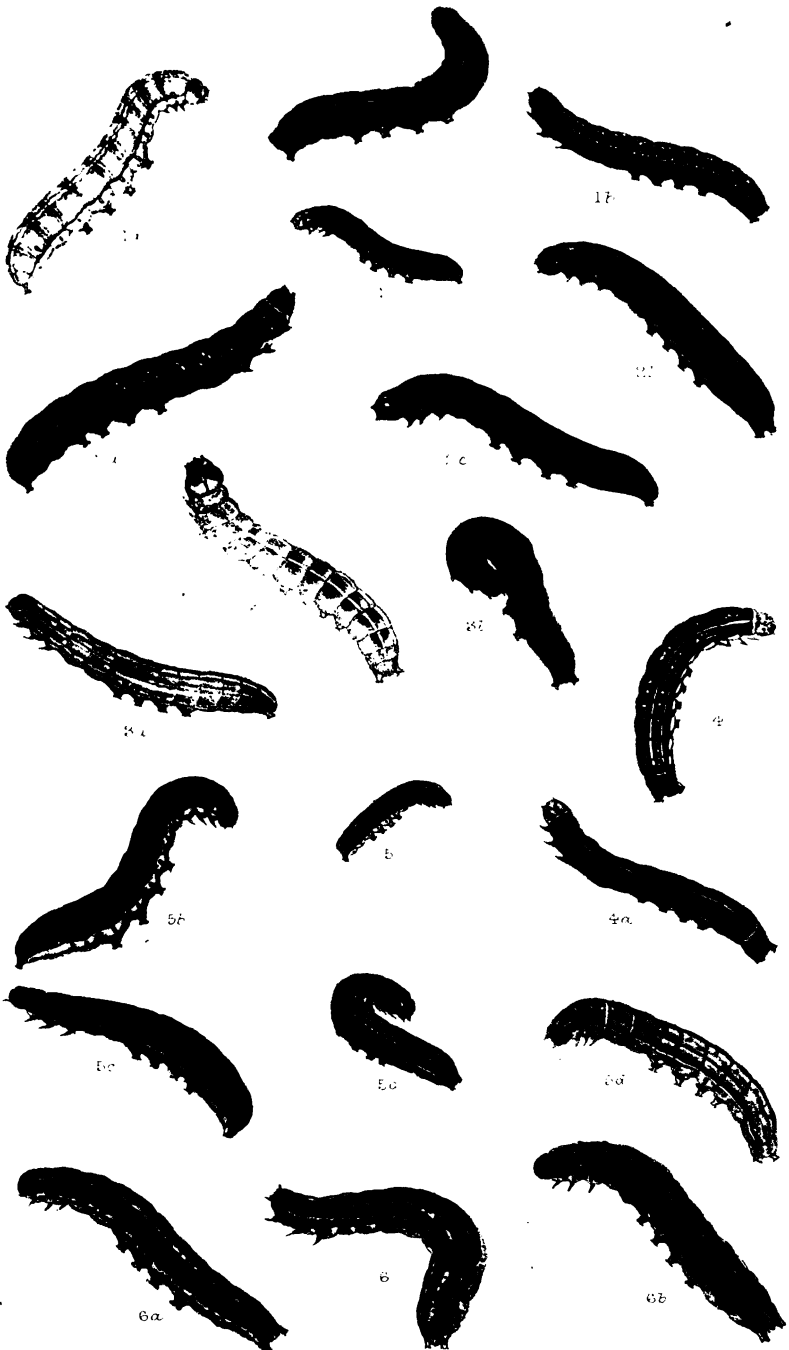
4, 4 *a*, 4 *b*, larvæ after last moult, on sallow, June 6th and 25th, 1861, and June 18th, 1870.

See p. 54.

TÆNIOCAMPA RUBRICOSSA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages; 5 *b* half grown; 5 *c* full grown, May 7th, 1859; the others June 19th, 1861, and June 6th, 1868, imagos March 28th, 1862, and April 4th, 1869.





F.C. Moore lith.

W. BUCKLER del.

West Newman imp.

PLATE LXXXI.

TÆNIOCAMPA INSTABILIS.

1, 1 *a*, 1 *b*, larvæ in various stages ; on oak, June 1st and 21st, 1861; 1 *a* on poplar, June 23rd, 1866, imago April 28th, 1867.

TÆNIOCAMPA OPIMA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ in various stages, on willow and osier, June 14th to 21st, 1867, and June 3rd, 4th, and 10th, 1872, imago March 20th to 22nd, 1868.

See pp. 54—57.

TÆNIOCAMPA POPULETI.

3, 3 *a*, 3 *b*, larvæ after last moult ; on poplar, June 9th, 1860, and on aspen, May 31st, 1869 ; imagos March 16th and 17th, 1861, and April 8th, 1870.

TÆNIOCAMPA STABILIS.

4, 4 *a*, larvæ after last moult ; eggs laid March 16th, 1859, at first green and changing to slate-colour when about to hatch ; 4 full grown May 17th, 1859, fed on willow ; imago March, 1860 ; 4 *a*, June 30th, 1860 ; imago March 3rd, 1861.

TÆNIOCAMPA GRACILIS.

5, 5 *a*, 5 *b*, 5 *c*, 5 *d*, larvæ in various stages ; 5 on *Carduus acanthoides*, June 24th, 1869, imago April 8th, 1870 ; 5 *a* on willow, cannibal ; 5 *c* on *Lysimachia vulgaris*, July 4th, 1868 ; 5 *d* on willow, July 10th, 1868, imago April 6th, 1869.

See p. 57.

TÆNIOCAMPA MINIOSA.

6, 6 *a*, 6 *b*, larvæ after last moult, on oak, June 9th to 14th, 1862.

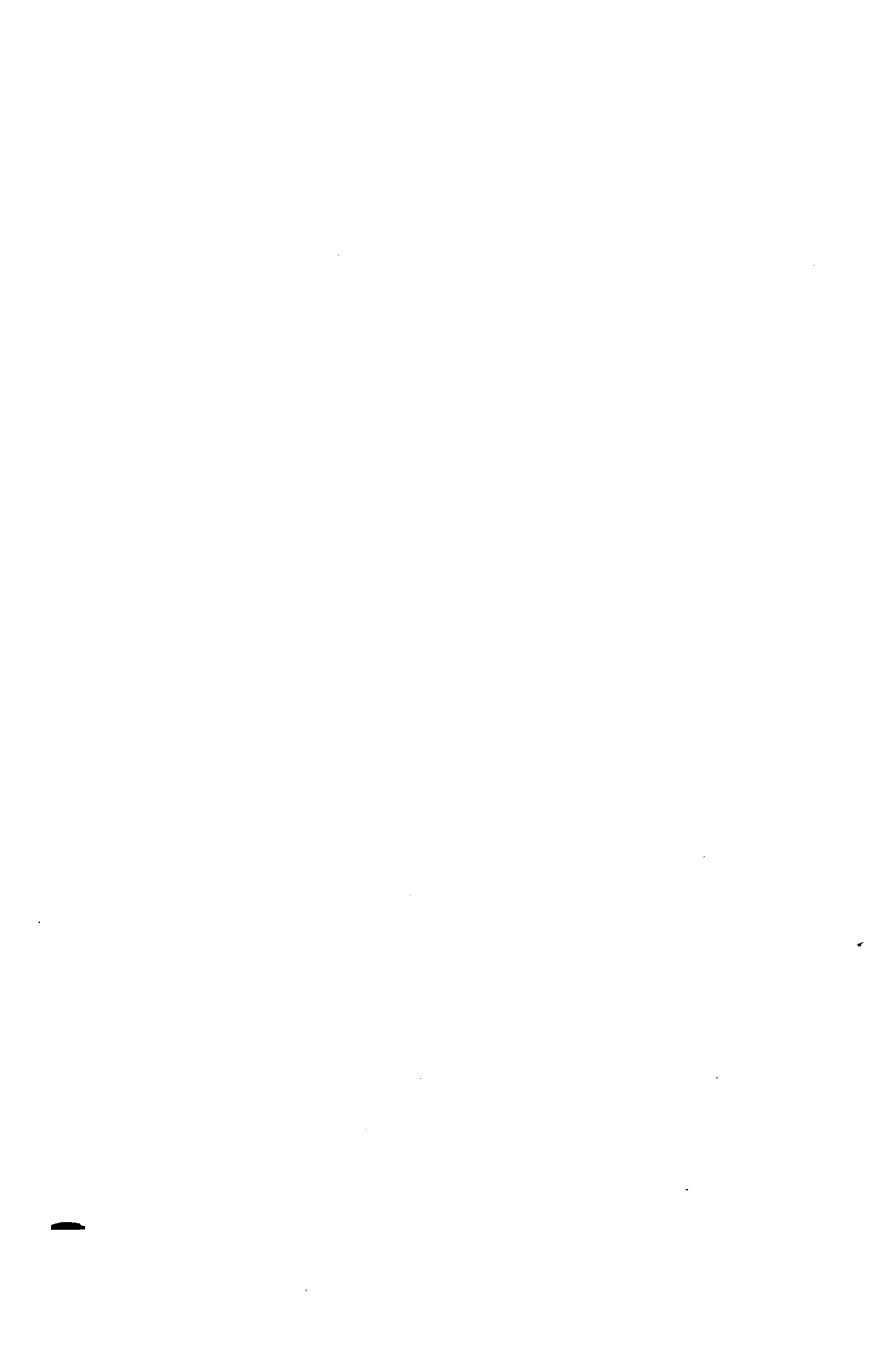


PLATE LXXXII.

TÆNIOCAMPA MUNDA.

1, 1 *a*, 1 *b*, larvæ in various stages ; 1, 1 *a*, May 29th and June 5th, 1865, on willow, imago March 30th, 1866 ; 1 *b* on oak, June 11th, 1860.

TÆNIOCAMPA CRUDA.

2, 2 *a*, 2 *b*, 2 *c*, 2 *d*, larvæ after last moult ; 2 *d* on willow, May 23rd, 1865, imago April 1st, 1866.
See pp. 58, 59.

ORTHOSIA SUSPECTA.

3, larva on birch and poplar, etc., June 9th, imago June 19th, 1871.
See pp. 59—62.

ORTHOSIA UPSILON.

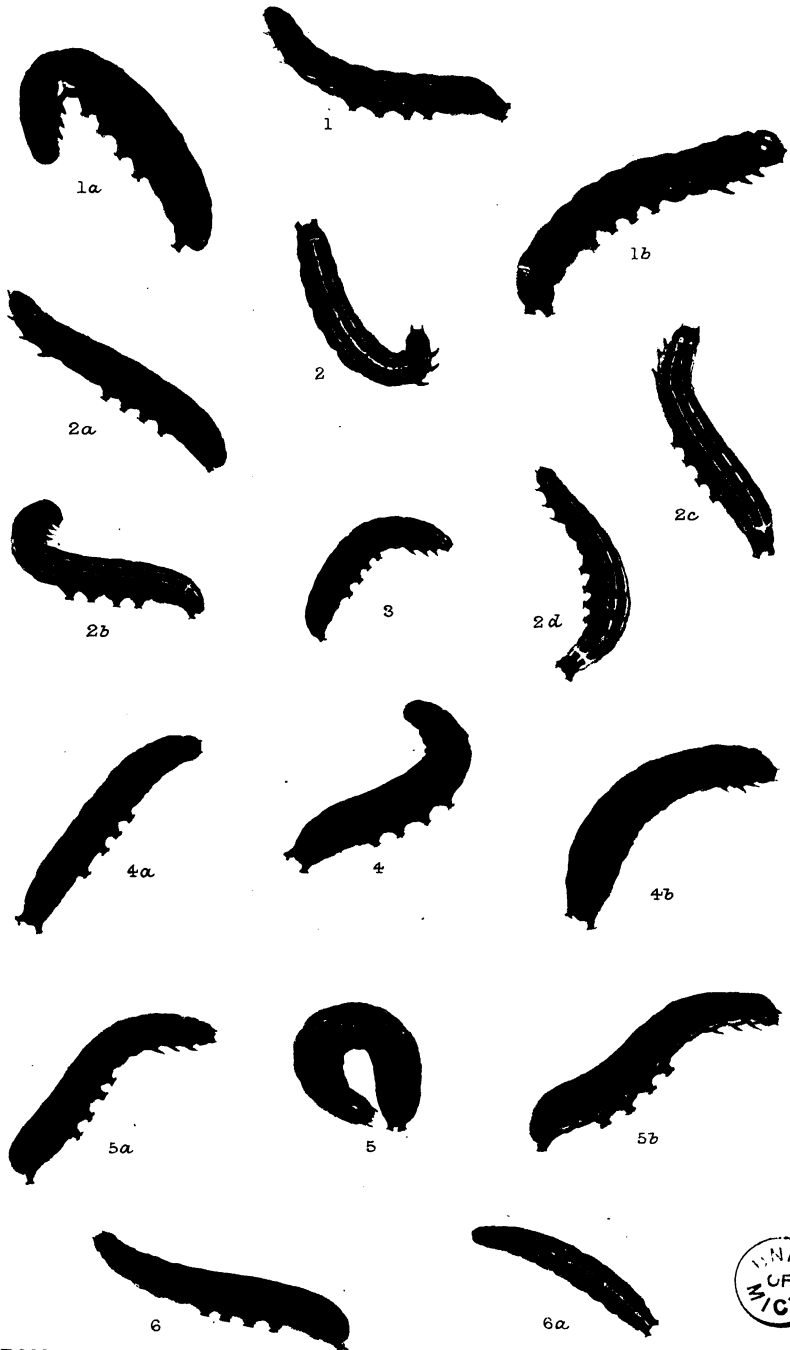
4, 4 *a*, 4 *b*, larvæ in various stages ; on willow, found under the bark, May 27th, imago June 27th, 1861 ; 4 *a* June 3rd, imago July 13th, 1864.

ORTHOSIA LOTA.

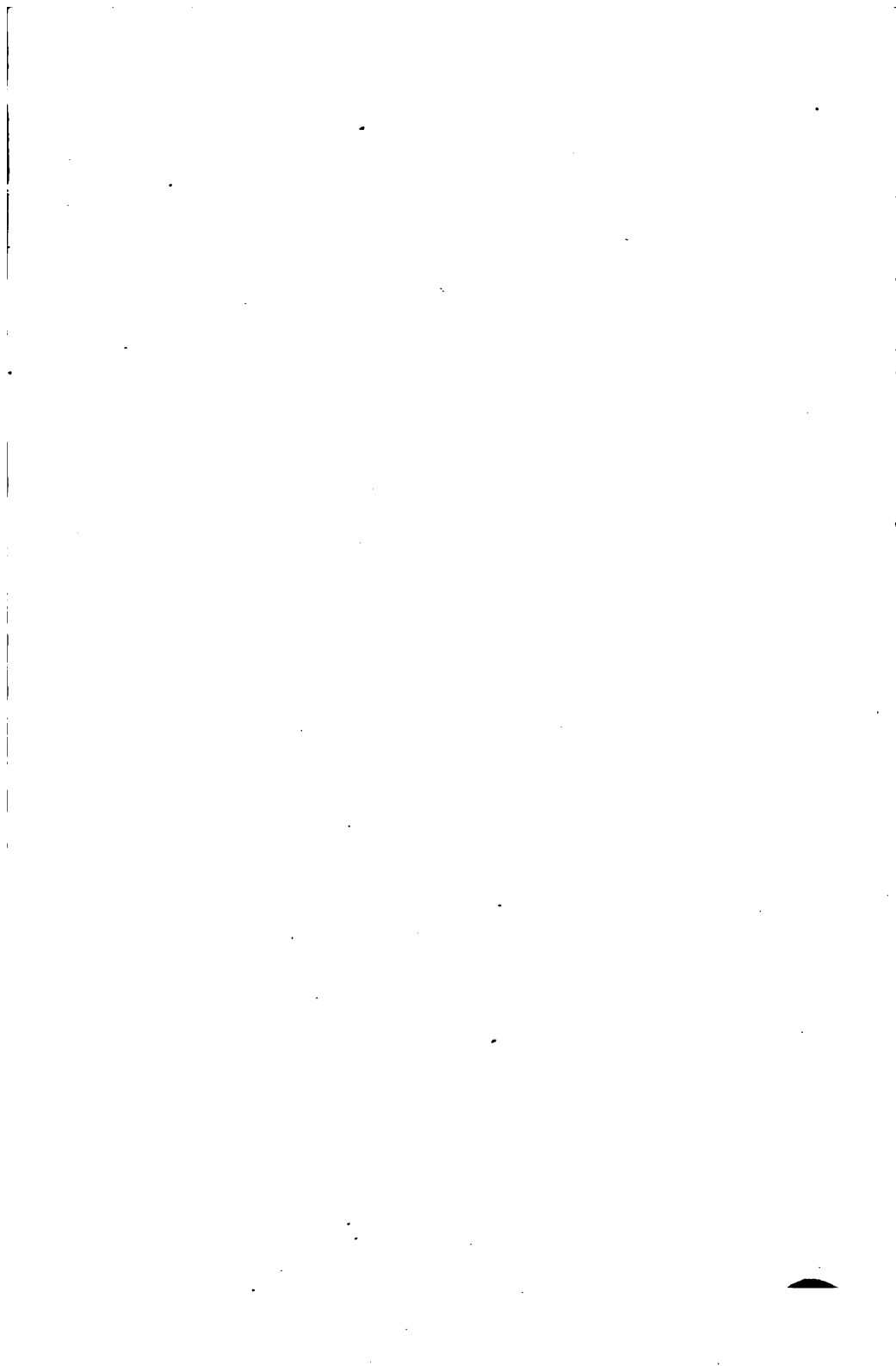
5, 5 *a*, 5 *b*, larvæ after last moult, on willow and oak, June 15th, 1860, May 22nd and 23rd, 1867, imagos October 3rd and 4th, 1867.

ORTHOSIA MACILENTA.

6, larva after last moult, on hawthorn, May 18th, 1861 ; 6 *a*, larva on oak, May 18th, imago September 14th, 1865.









F.C. Moore lth.

W. BUCKLER del.

West Newman imp.

PLATE LXXXIII.

ANCHOCELIS RUFINA.

1, 1 *a*, 1 *b*, larvæ in various stages; 1, 1 *a*, from eggs, reared first on elm and then on oak, figured May 18th and June 1st, 1883; 1 *b* on oak, May 28th, 1862, imago October 6th, 1862.

See pp. 62—65.

ANCHOCELIS PISTACINA.

2, 2 *a*, 2 *b*, 2 *c*, larvæ in various stages; 2 *a* found on *Carex*, June 24th, 1863; 2 *b* found on oat-grass, also ate willow, May 27th, imago September 19th, 1874; 2 *c* on clover, June 11th, imago October 3rd, 1868.

ANCHOCELIS LUNOSA.

3, 3 *a*, 3 *b*, 3 *c*, 3 *d*, larvæ in various stages; 3 *b* and 3 *d* on grass, March 26th and April 12th, 1862; 3 *a*, April 24th to 27th, imago October, 1865; 3 *c* from eggs hatched October 25th, 1865, figured April 30th, 1866, imago October 20th, 1866.

See pp. 65, 66.

ANCHOCELIS LITURA.

4, 4 *a*, 4 *b*, larvæ after last moult; on *Ranunculus repens*, May 8th and 24th, 1872; on dock and willow May 24th, 1866; from eggs, fed on rose at first, afterwards on bramble, May 28th, 1870, imagos September 2nd to 6th, 1870.

See pp. 66—69.

CERASTIS VACCINII.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages; 5 reared from eggs laid by a hibernating specimen taken at willow bloom, April, fed on dock, June 29th, imago September, 1860; 5 *a* on oak, June 15th, imago September 3rd, 1869; 5 *b* on oak, July 6th, imago September 30th, 1861; 5 *c* on clematis, June 10th, imago September, 1864.

CERASTIS SPADICEA.

6, 6 *a*, 6 *b*, larvæ after last moult; 6 on hawthorn, June 25th, imago October, 1860; 6 *a* June 15th, imago October 14th, 1868; 6 *b* one of eight reared from the egg on hawthorn, oak, willow, and chickweed, June 26th and 29th, imagos October 11th to 25th, 1867.

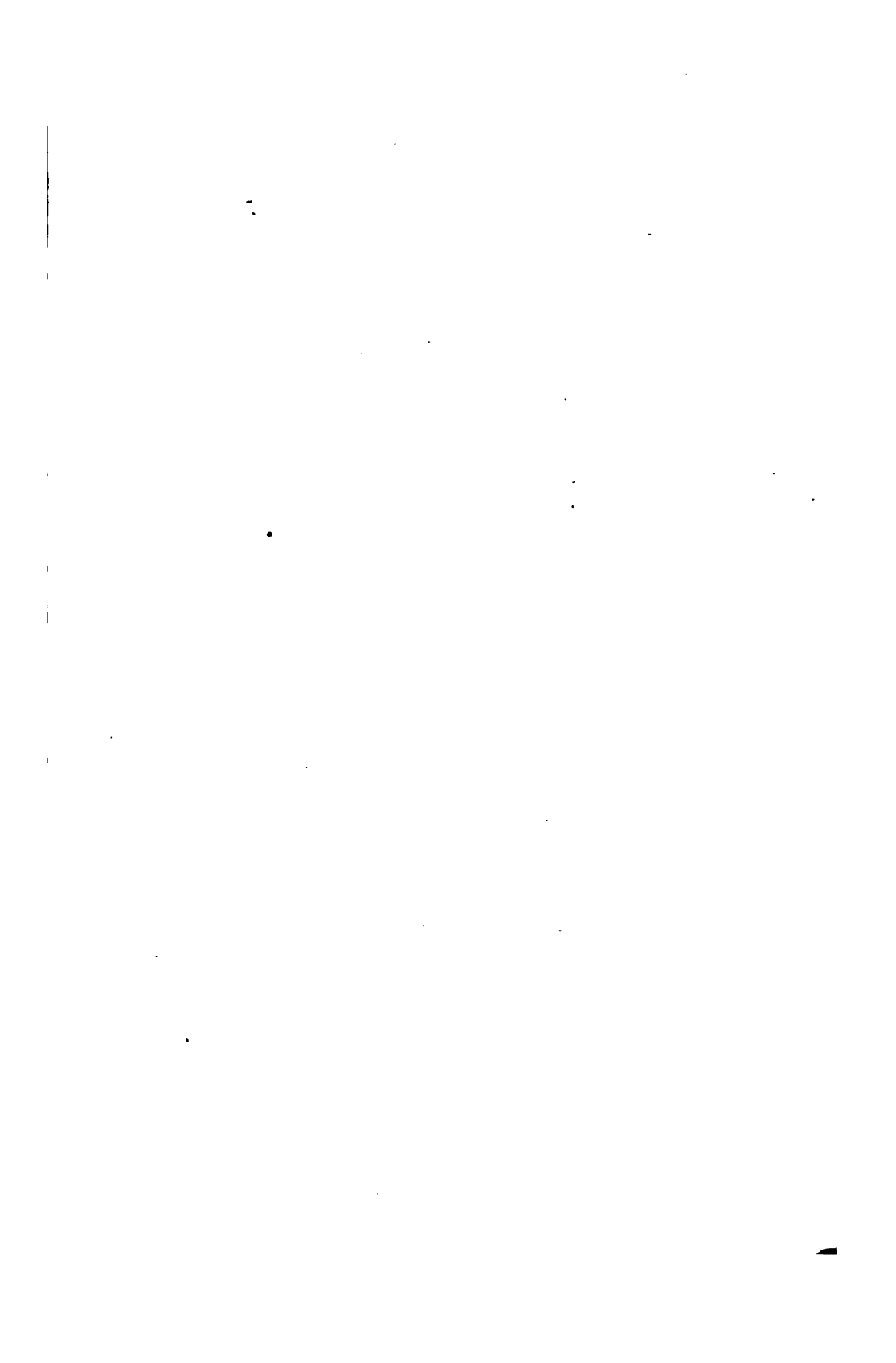


PLATE LXXXIV.

SCOPELOSOMA SATELLITIA.

1, larva after last moult, figured May 28th, 1861; destroyed alone fifty-seven larvæ of *Tæniocampa populeti* in the course of a fortnight.

DASYCAMPA RUBIGINEA.

2, 2 a, larvæ after last moult, reared from eggs, fed on aloe and plum, figured June 3rd and 5th, imagos appeared September 23rd and 29th, 1868.

See pp. 69—72.

HOPORINA CROCEAGO.

3, young larva; 3 a, larva after last moult; figured June 30th, 1860, and June 25th, 1861.

XANTHIA CITRAGO.

4, 4 a, 4 b, larvæ after last moult; 4 on lime, June 6th, 1860; 4 a, 4 b, on lime, May 25th and 26th, imagos August 29th and 30th, 1869.

See pp. 72, 73.

XANTHIA CERAGO.

5, 5 a, 5 b, 5 c, larvæ after last moult; 5 in willow catkins, May 2nd, 1861; 5 a from a batch of six in willow catkins, and afterwards on leaves of willow, May 8th to 10th, 1869, and twenty in downy *Salix* catkins from Perthshire, afterwards on leaves, May 17th, 1869; imagos appearing July 31st to August 10th and August 2nd to 13th, 1869; 5 b on seeds of wych elm, May 25th, imago August 3rd, 1861; 5 c on willow, June 6th, imago September 5th, 1860.

See pp. 73—75.

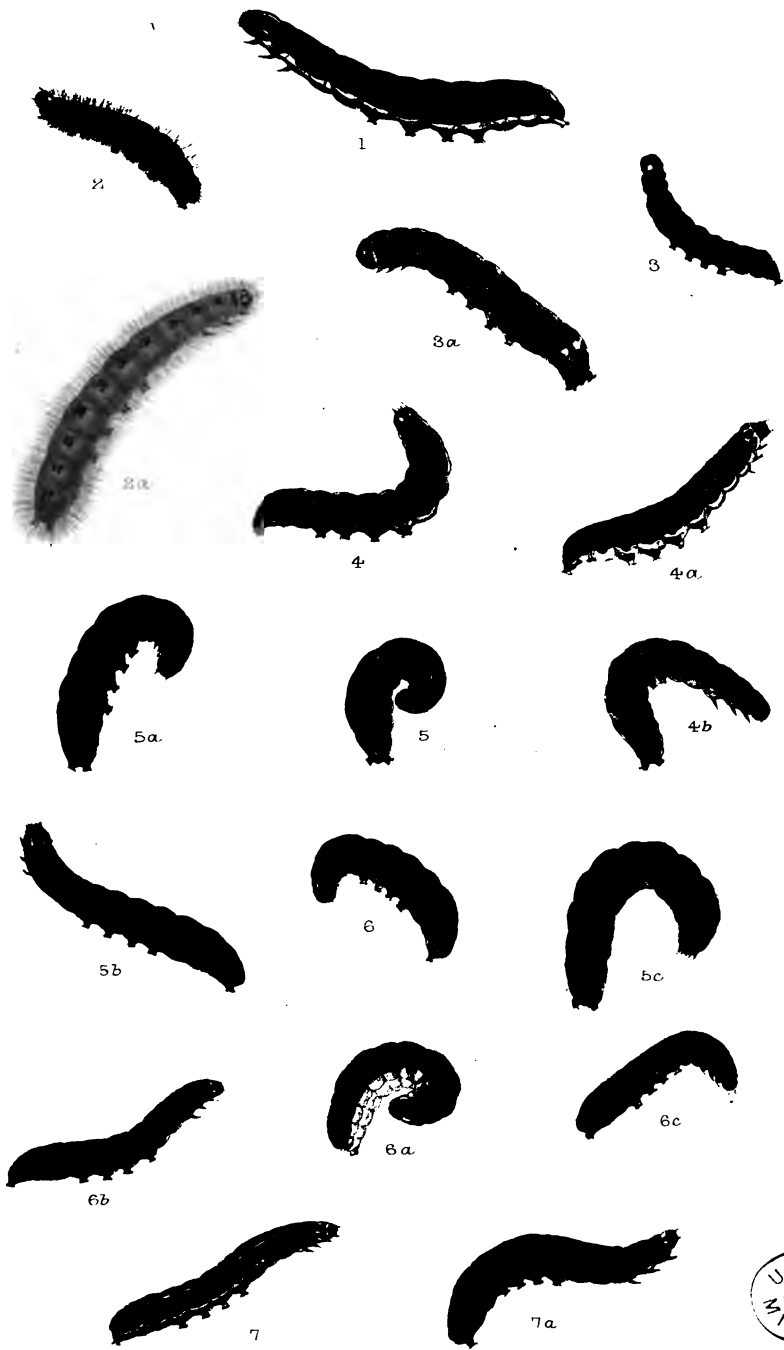
XANTHIA FLAVAGO.

6, 6 a, 6 b, 6 c, larvæ after last moult; on willow catkins, May 22nd, and on seeds of wych elm, May 25th, imagos August 14th and 1st, 1861; 6 b and 6 c in willow catkins, May 29th, imago August 30th, 1867.

See p. 76.

XANTHIA AURAGO.

7, 7 a, larvæ after last moult; on buds and leaves of beech, May 5th and 19th, imagos September 17th to 26th, 1866.





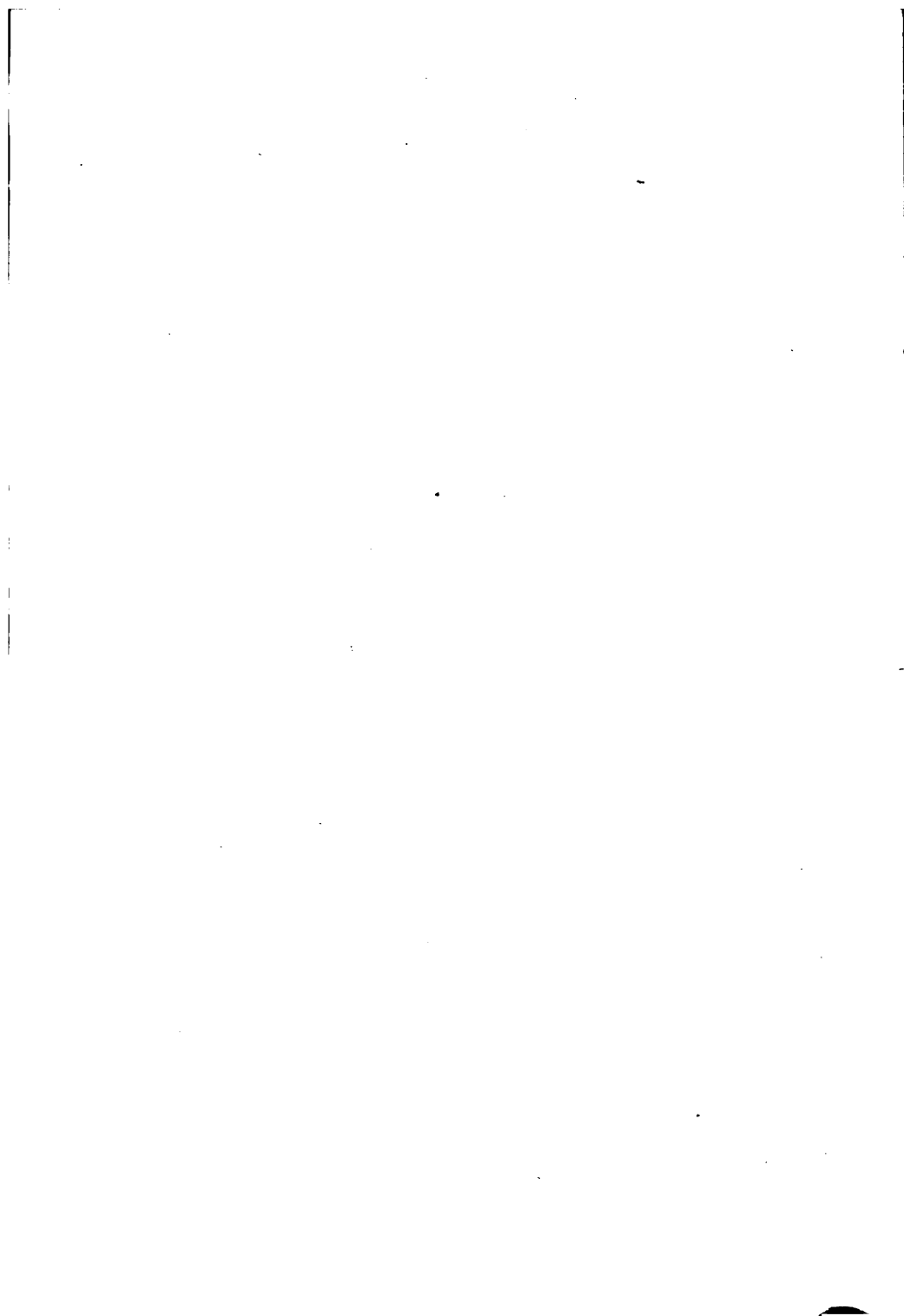


Plate LXXXV.



C. Moore lith.

W. BUCKLER del.

West, Newman imp.

PLATE LXXXV.

XANTHIA GILVAGO.

1, 1 *a*, 1 *b*, larvæ after last moult; on seeds of wych elm, June 5th and 7th, imagos August 28th and 31st and September 5th, 1867.

See pp. 76, 77.

XANTHIA FERRUGINEA.

2, 2 *a*, 2 *b*, 2 *c*; 2 figured July 10th, 1860; 2 *a* on seeds of wych elm, figured June 7th, imago August 24th, 1867; 2 *b* and 2 *c* found under common elm, from dropped seed blossoms, and fed on narrow-leaved plantain, figured May 10th, imago August 10th, 1865.

See p. 78.

CIBICEDIA XERAMPHELINA.

3, 3 *a*, 3 *b*, larvæ after last moult; hides by day in chinks of ash bark, ascending at night to eat the leaves; 3 figured on May 22nd, when nearly full fed, imago September 5th, 1867.

See pp. 78—80.

TETHEA SUBTUSA.

4, 4 *a*, 4 *b*, 4 *c*, larvæ in various stages; 4 and 4 *c* between leaves of aspen, June 3rd, imago July 16th, 1864; 4 *a* and 4 *b* figured June 4th and 5th, imagos July 14th and 16th, 1878.

TETHEA RETUSA.

5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages; 5 *c* on long narrow-leaved willow, June 9th, imago August 28th, 1860; 5, 5 *a*, and 5 *b* between leaves or in curled-up leaves of *Salix cinerea*, May 25th, imagos July 22nd to 27th, 1867.

See pp. 80, 81.

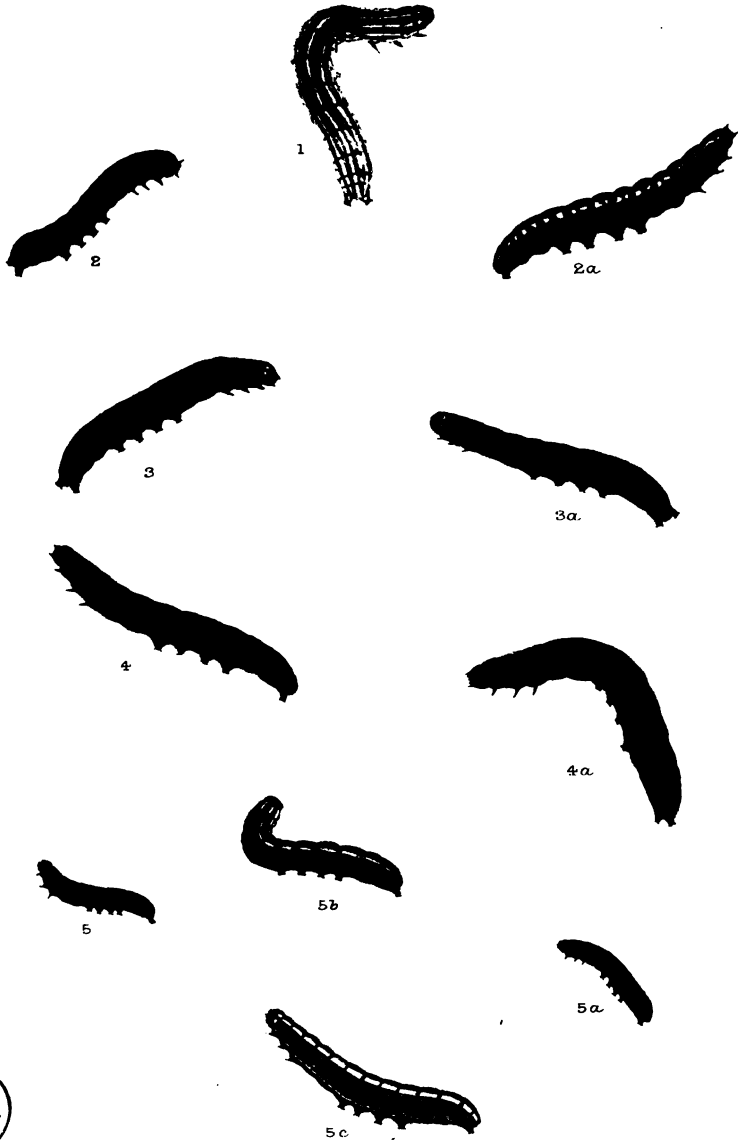


PLATE LXXXVI.

EUPERIA FULVAGO.

- 1, larva after last moult, on birch, June 21st, 1862.
See pp. 81—83.

DIOCYCLA Oo.

- 2, 2 *a*, larvæ on oak, May 23rd to 29th, sent by Rev.
J. Hellins, imagos July 8th, 1882.
See pp. 83—85.

COSMIA TRAPEZINA.

- 3, 3 *a*, larvæ after last moult ; 3 on rose, elm, etc.,
June 24th, imago August 7th, 1869 ; 3 *a* on oak,
June 1st, 1861.

COSMIA DIFFINIS.

- 4, 4 *a*, larvæ after last moult, fed on elm, figured
June 8th, imago emerged August 2nd, 1875.
See pp. 85, 86.

COSMIA AFFINIS.

- 5, 5 *a*, 5 *b*, 5 *c*, larvæ in various stages ; 5 and 5 *a* on
elm, from Rev. J. Hellins, May 11th, 1881 ; 5 *b* and 5 *c*
on elm, June 1st, 1861, and June 8th, 1864, imago
July 31st, 1864.

See pp. 86, 87.

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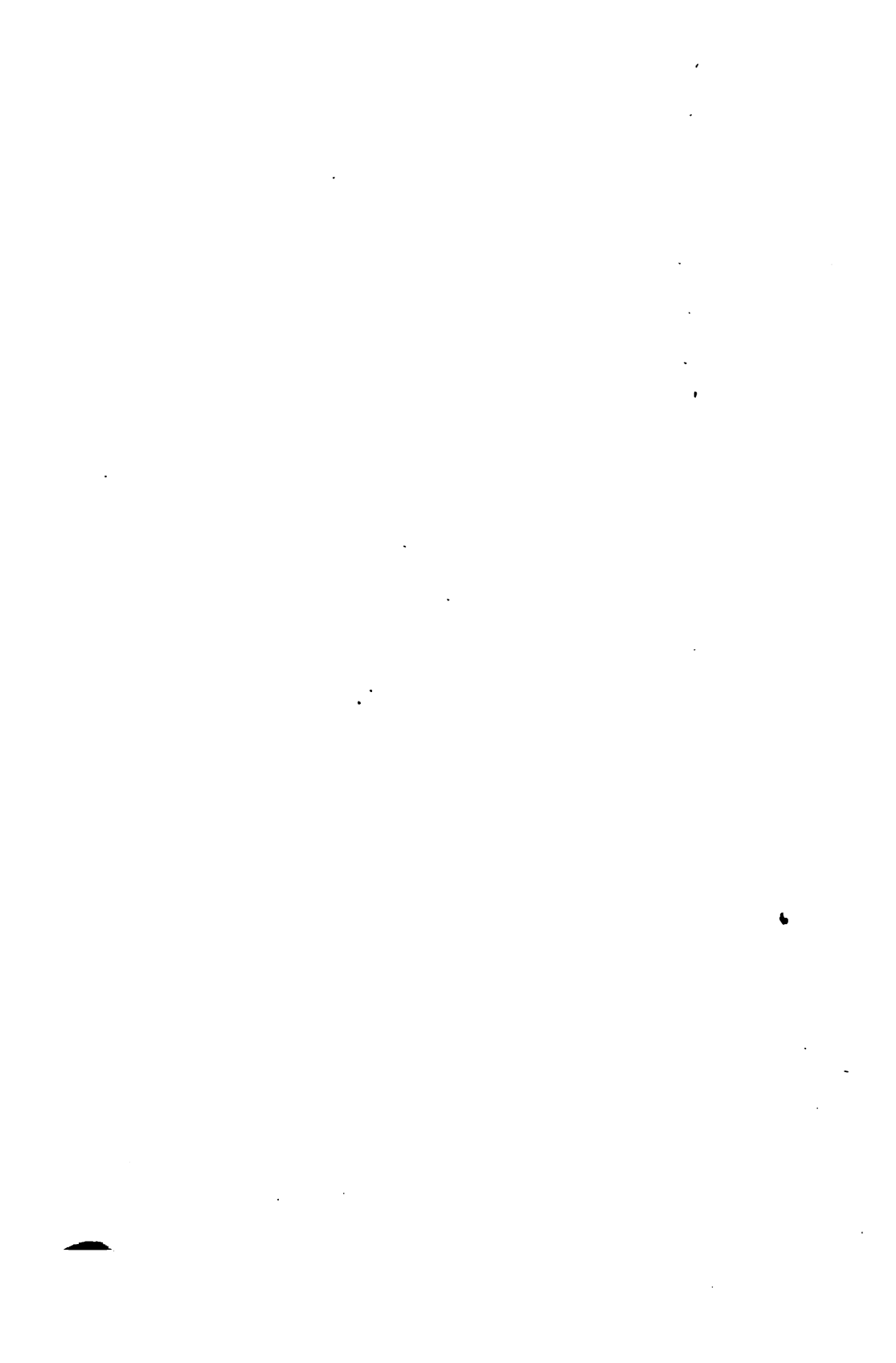
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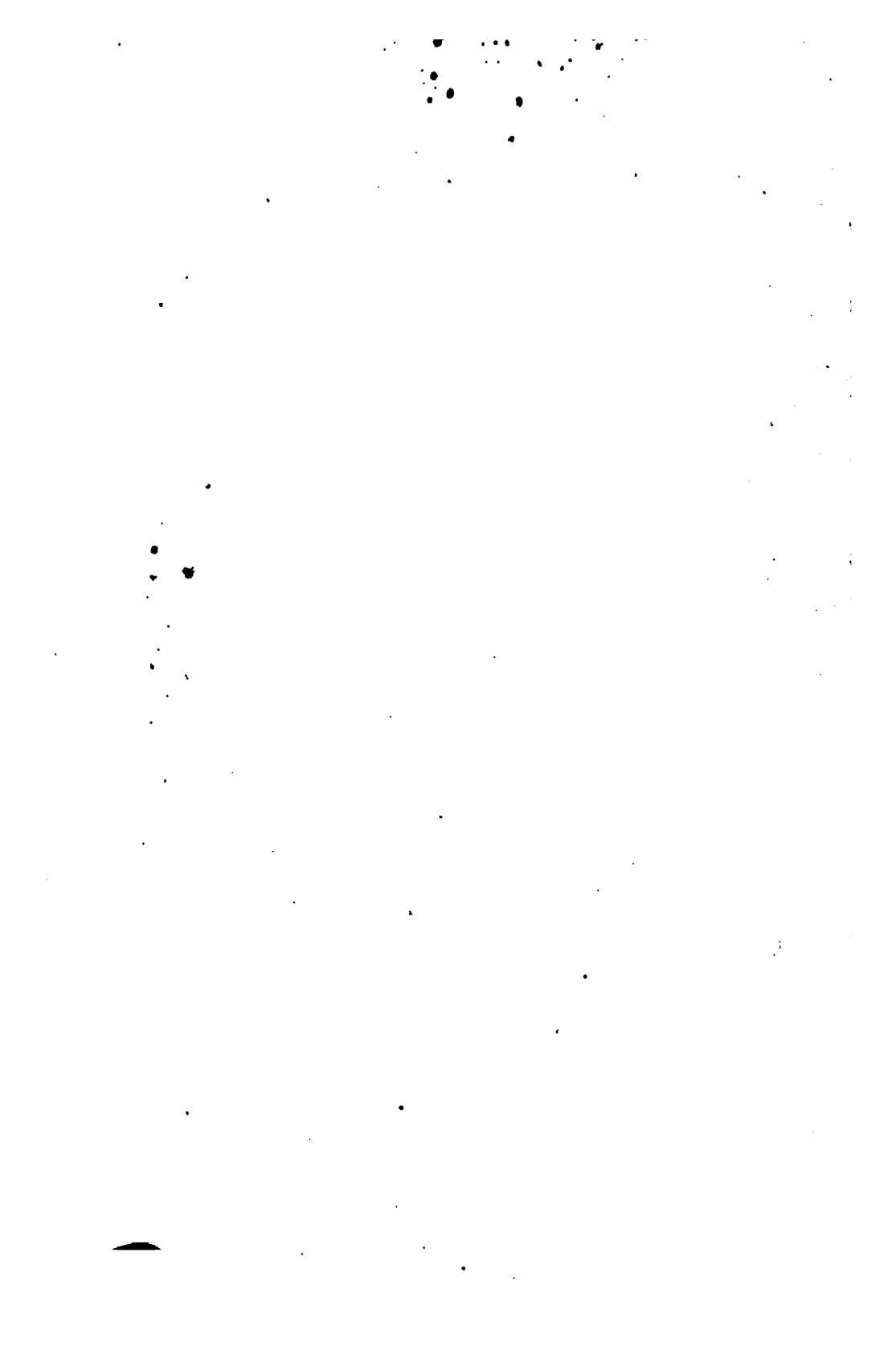
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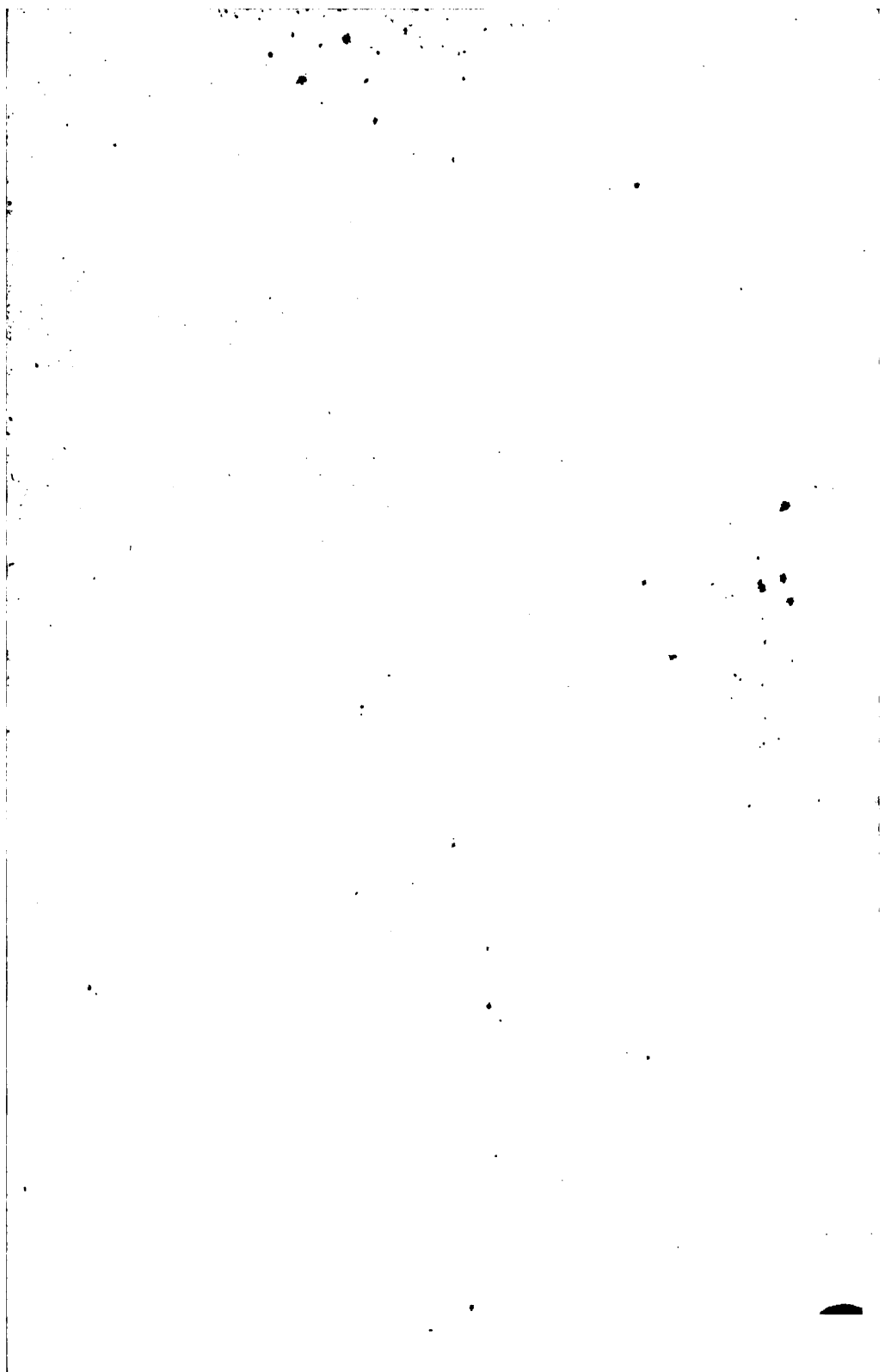
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